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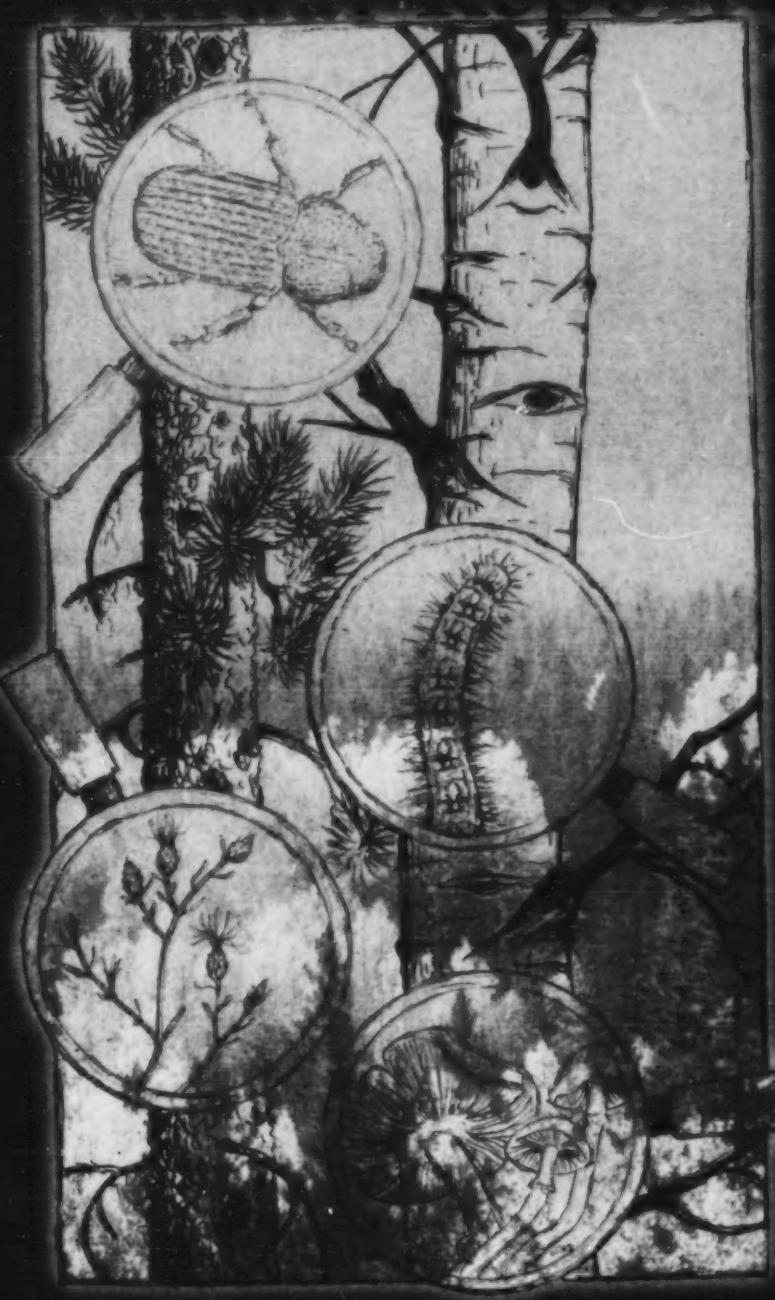

# Forest Health in Alberta

Alberta

2007-00089

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## Annual Report

2005

Alberta

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## Forest Health Vision

*A healthy forest environment that provides sustainable fibre resources and a diverse forest ecosystem that supports biodiversity and critical wildlife habitats.*

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- Hinton Wood Products (Weldwood), Weyerhaeuser Canada Ltd. and Alberta Newsprint Company

**Northwest Forest Health Program**

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- Geoff Atkinson, Craig Brown, Danny Brown, Mark Feser, David Johnson, William Lesiuk, Dave Poschailo and Cheryl Tchir

**Northeast Forest Health Program**

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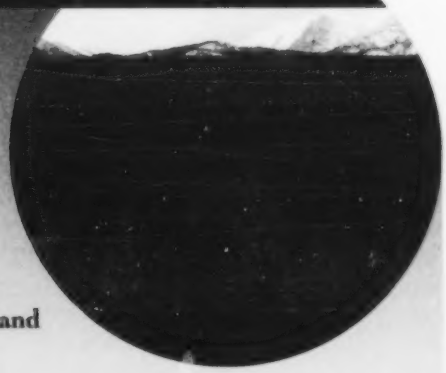
- Gennie Alojas, Ed Barnett, Kali Hennessey, Dave Moseley, Gunnilla Nilsson, Marty Robillard and Steven Stryde



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**Report Design and Publishing**

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Below is a summary of the extent of major forest pest infestations surveyed in 2005:

| Pest Species | Extent of Infestation |
|---|---|
| Spruce budworm | 10 020 ha net area and 3 869 ha gross area |
| Mountain pine beetle | 7 956 of 8 226 attacked trees removed. |
| Aspen defoliators | 2 818 387 ha of gross area |

Spruce budworm defoliation on inventoried forested Crown land decreased from an estimated 26 922 ha in 2004 to 10 020 ha in 2005. The severity of defoliation also decreased during this period.

The Ministerial Order prohibiting transportation of pine wood and wood products with bark was enforced in cooperation with Alberta Transportation. There were four intercepts of unauthorized pine log movement in 2005.

Between fall 2004 and summer 2005, aerial and ground surveys detected mountain pine beetle activity in Willmore Wilderness Park, Kakwa Wildland Provincial Park and surrounding area, Bow Valley, Cypress Hills Inter-Provincial Park, Spray Lake, Oldman River and Crowsnest Pass. Infestations also occurred in Banff and Jasper national parks.

Under pine beetle control programs from September 2004 until August 2005, 7 956 infested pines were removed from municipal and private lands (252 trees), Banff National Park (1 200 trees), and forested Crown lands (6 504 trees). About 500 pheromone baits were deployed in Banff National Park. Over 1 100 baits were deployed in provincial parks to contain pine beetles and control during the winter.

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The number of smaller European elm bark beetles (SEEBB) trapped in the province decreased significantly in 2005, compared to 2004. Alberta remains free of DED. However, a similar vascular wilt disease was affecting elm trees in the City of Edmonton. The ash leaf cone roller and the red elm weevil damaged some elm trees in Edmonton. Edmonton also lost many ash trees due to drought.

As a member of an interdepartmental invasive alien species working group established in 2005, Sustainable Resource Development (SRD) commenced development of a risk management framework on invasive species. Regionally, increased education and awareness, detection, and control programs received priority under invasive species management programs.

The forecast for 2006 indicates increase of mountain pine beetle infestations, new spruce budworm infestations in the northeast and expanding forest tent caterpillar infestations. The risk of two-year cycle budworm outbreaks occurring in 2006 in the Southwest Region is high but may not materialize.

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Management of tree health on forested Crown land is the responsibility of the Forest Health Section of the Department of Sustainable Resource Development (SRD). This is accomplished by effective detection and monitoring of forest pests, and by implementing pest management strategies that recognize joint responsibility with forest industry.

Managing forest health issues on national parks and native Indian reserves in the province is a federal responsibility. The Department of Community Development is responsible for tree health in provincial parks and protected areas. The municipal governments, private landowners and Metis Settlements look after tree health on their respective lands.

The forest health program in Alberta is administered and coordinated by the provincial headquarters. In 2005, the Regional Forest Health Officers - Northeast Corporate Region (Tom Hutchison), Northwest Corporate Region (Mike Maximchuk) and Southwest Corporate Region (Dan Lux/Christie Ward and Erica Lee) - looked after operational aspects of regional forest health programs. Embedded within each corporate region are several corporate areas (Appendix I).

The current mountain pine beetle (MPB) infestation in Alberta was first reported in 1998 when nearly a dozen patches of MPB-killed pines were confirmed by ground surveys carried out in Banff National Park. At the initial stages the events of the MPB program were reported on a calendar year basis. This reporting led to confusion because events of the MPB program overlap two calendar years. Consequently, the Forest Health Section decided to base its reporting on a "beetle year" basis, i.e., beginning with results of the pheromone-based monitoring program in the summer and aerial overview surveys in the fall of one year, and ending up with the resulting management program in the following year. This enables us to report on events related to the same generation of beetles.

The 2005 annual report covers MPB-related events beginning with the pheromone-based monitoring program carried out in 2004 summer and ending with the control program carried out in 2005 summer. However, results of the 2005 pheromone-based monitoring program and 2005 aerial survey are briefly discussed in relation to predictions on MPB occurrence in 2006.

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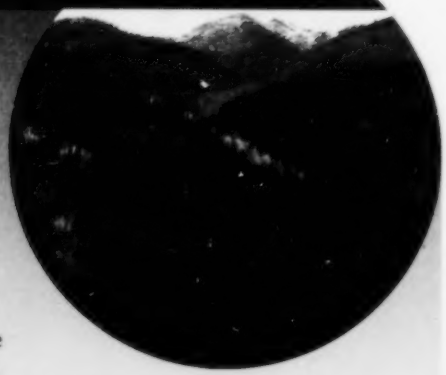

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Many other forest pests, besides those reported here, affect forested Crown land in Alberta. These include major diseases such as the lodgepole pine dwarf mistletoe, rusts, cankers, stem rots and root rots like Armillaria root disease. As well, insect pests such as terminal weevils, other defoliators, other bark beetles and the root collar weevil are known to affect forest trees in the province. However, details of these pests are not reported here because they were not monitored in 2005.

The surveys reported in this document were conducted for operational purposes over the forested Crown land and may not cover the entire forested provincial land base. Although every effort is made to ensure that information reported in this document is accurate and complete, its integrity is not guaranteed.

Note: Details about the operational use of pheromones are in Appendix II.

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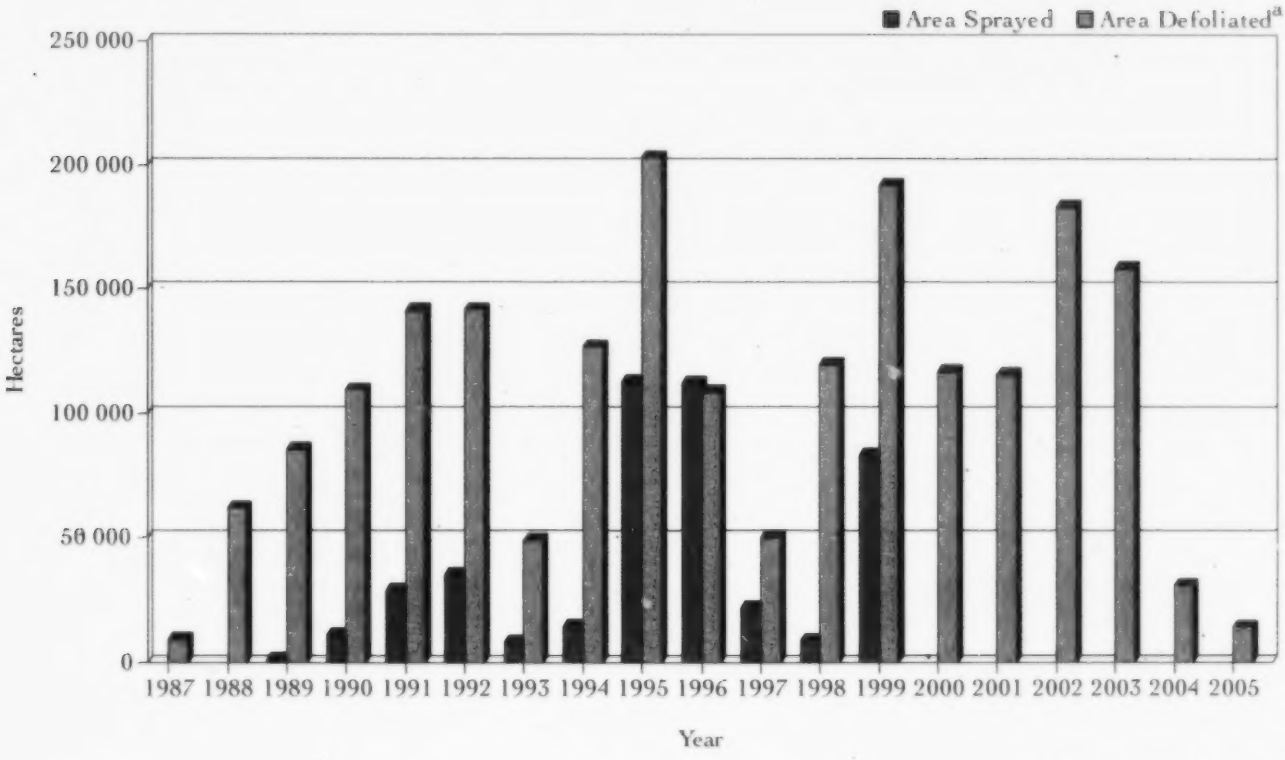
# Forest Pest Conditions in 2005

## Insect Pests

### Defoliators

**Spruce Budworm**
***Choristoneura fumiferana* (Clemens)**

The current outbreak, first recorded in 1987 reached a peak in 1995. Aerial spraying to control the spruce budworm was discontinued in 1999 (Figure 1). In 2004, the outbreak collapsed in most of the infested areas. Relatively large-scale tree kill has been observed in areas severely defoliated for over eight consecutive years.




[a] Forested Crown Land

***Figure 1***
Area annually defoliated by the spruce budworm and area annually sprayed to control spruce budworm infestations in Alberta, 1987 - 2005.

Aerial surveys are carried out in the summer to detect infestations and estimate the extent and severity of spruce budworm defoliation. Fixed wing aircraft are used for these surveys. Defoliation is recorded either digitally by using a tablet personal computer loaded with an electronic map (in conjunction with a Global Positioning System) or manually by using hard copies of 1:250 000 scale maps. The surveyors record spruce budworm defoliation either as moderate (35-70%) or as severe (>70%).

In 2005, the total number of hectares defoliated declined by 55% compared to the number defoliated in 2004. The number of hectares severely defoliated declined by 49% and number of hectares moderately declined by 57% compared to the corresponding figures in 2004. (Figures 2 and 3; Table 1)

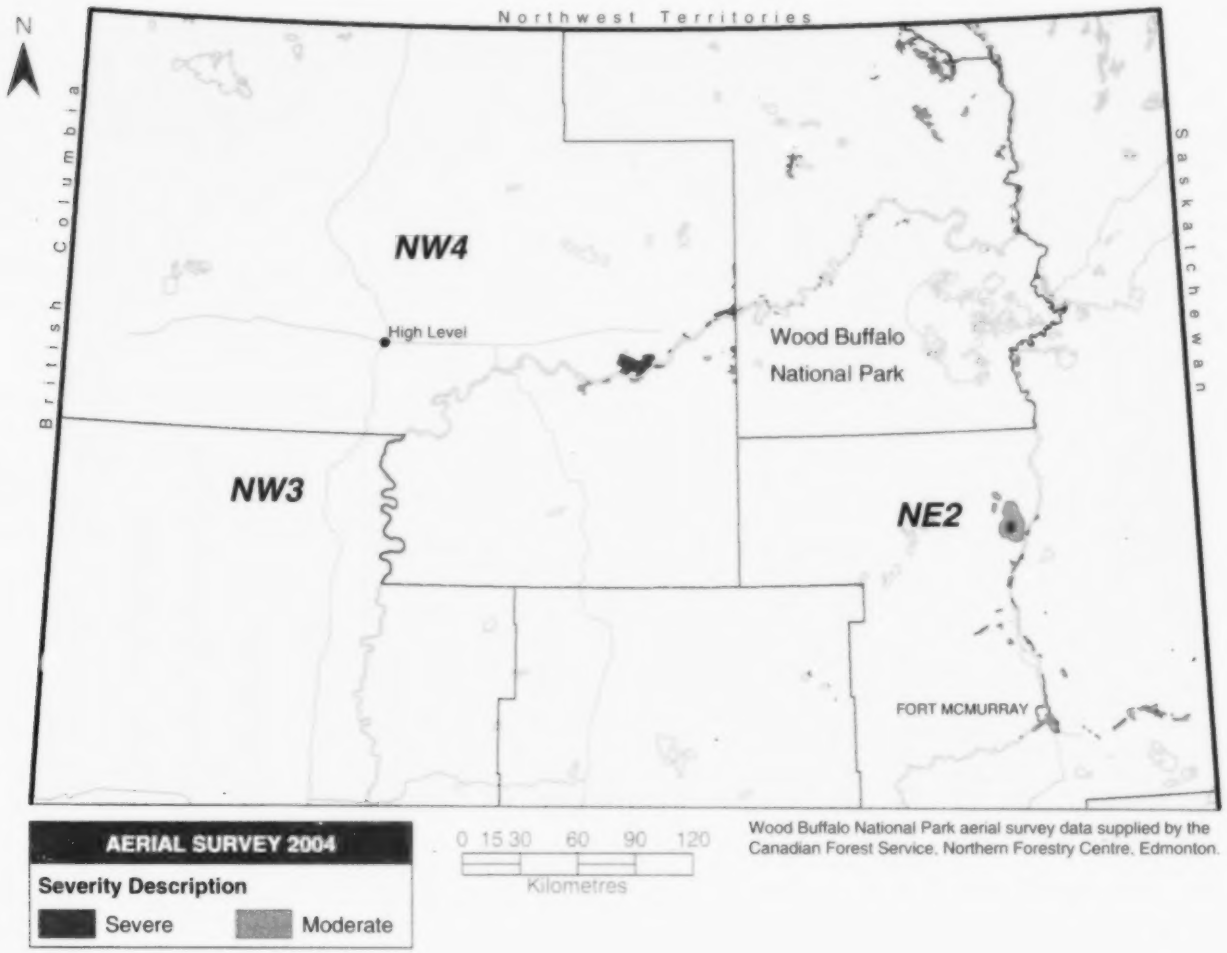



*Figure 2*
Spatial distribution of aerially visible spruce budworm defoliation on forested areas surveyed in Alberta in 2004.

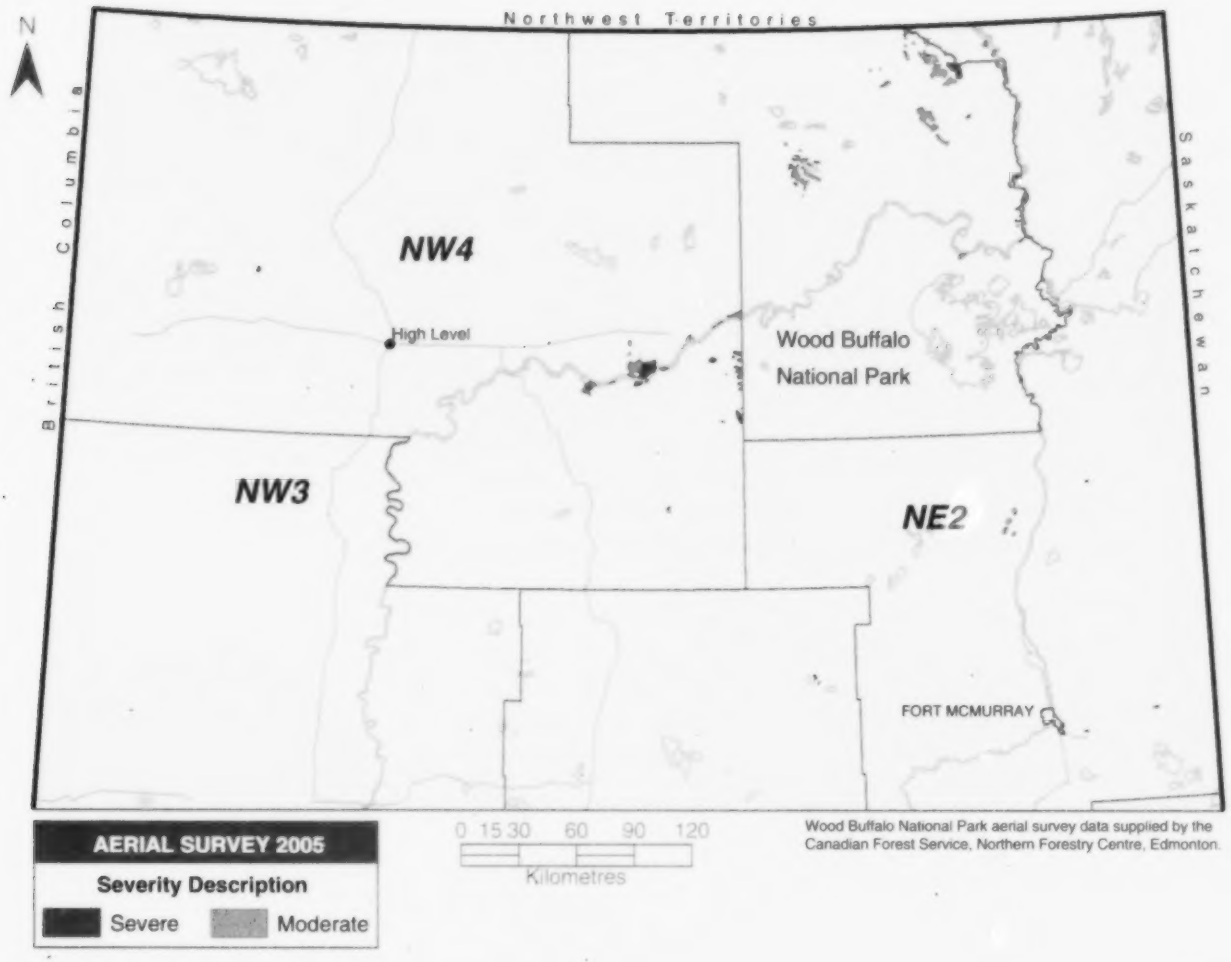



*Figure 3*
Spatial distribution of aerially visible spruce budworm defoliation on forested areas surveyed in Alberta in 2005.

*Table 1*

The extent of spruce budworm defoliation (ha) by severity categories in Alberta[a], 2004 vs. 2005

| | 2004 | | | 2005 | | |
|---|---|---|---|---|---|---|
| | Moderate | Severe | Total | Moderate | Severe | Total |
| Net[b] | 20 245 | 6 677 | 26 922 | 6 636 | 3 384 | 10 020 |
| Gross[c] | 3 105 | 624 | 3 729 | 3 495 | 374 | 3 869 |
| Total | 23 350 | 7 301 | 30 651 | 10 131 | 3 758 | 13 889 |
| % Changed[d] | - | - | - | -57% | -49% | -55% |

[a] Extent of defoliation reported from forested Crown land surveyed; national parks excluded

[b] Extent of defoliation reported from inventoried forest land

[c] Extent of defoliation reported from non-inventoried forest land

[d] Percent change of totals in 2005 compared to the corresponding figures in 2004

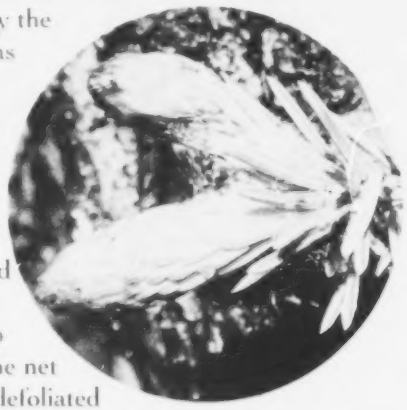
Northeast Corporate Region (NE)

The regional Forest Health personnel and a private contractor carried out overview aerial surveys during the last week of July and the first week of August. The surveyors used a fixed wing aircraft (Cessna 206). This survey concentrated on major river drainages in this region.

Personnel from the Northern Forestry Centre of Canadian Forest Service, Natural Resources Canada surveyed budworm defoliation on Wood Buffalo National Park. The combined results of these surveys are shown on Figure 3.

Overall, there was a 75% decrease in spruce budworm defoliated area in this region.

In the non-inventoried area of this region (north of 58° N latitude), the gross area of defoliation was 2 318 ha, a 38% decrease compared to the gross area defoliated in 2004. This included an estimated 374 ha that were severely defoliated and 1 944 ha that were moderately defoliated (Table 2). However, this may be an underestimation because defoliation symptoms, i.e., reddish brown needle remnants, appeared to have been washed off by the time the survey was conducted[2].



In the inventoried area of this region (south of the latitude 58° N), the gross defoliated area increased by 100% compared to 2004 (Table 2). The net spruce budworm-defoliated area decreased by 91%, compared to the defoliated area in 2004.

[2] Tom Hutchison, FHO, NE Region, personal communication

*Table 2*
The extent of spruce budworm defoliation in the Northeast Corporate Region by severity categories, 2004 vs. 2005

| Defoliated Area | Extent of Defoliation (ha) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2004 | | | 2005 | | | |
| | Moderate | Severe | Total | Moderate | Severe | Total | Change |
| North of Lat. 58° N[a] | 3 105 | 624 | 3 729 | 1 944 | 374 | 2 318 | -38% |
| South of Lat. 58° N[a] | 0 | 0 | 0 | 1 551 | 0 | 1 551 | 100% |
| [b] | 17 080 | 690 | 17 770 | 1 580 | 0 | 1 580 | -91% |
| NE Region Totals | 20 185 | 1 314 | 21 499 | 5 075 | 374 | 5 449 | -75% |

[a] gross area (non-inventoried forest land)
[b] net area (inventoried forest land)

The extent and severity of spruce budworm defoliation during the last four years in areas north of 58° N are shown on Figure 4. There was no consistent pattern of defoliation, i.e., an increase in these parameters in 2003 followed by a collapse in 2004 and 2005. In contrast, a consistent decline of the same parameters was observed in areas south of latitude 58° N over the same period (Figure 5).

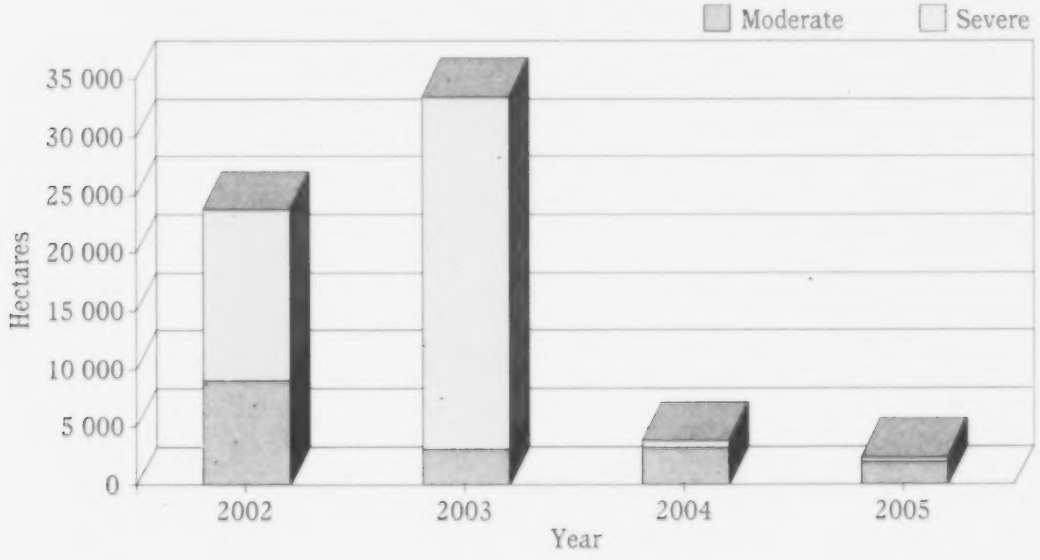



*Figure 4*
Gross area (ha) of spruce budworm defoliation north of latitude 58° N in the Northeast Region in Alberta, 2002-2005.

*Table 1*

The extent of spruce budworm defoliation (ha) by severity categories in Alberta[a], 2004 vs. 2005

| | 2004 | | | 2005 | | |
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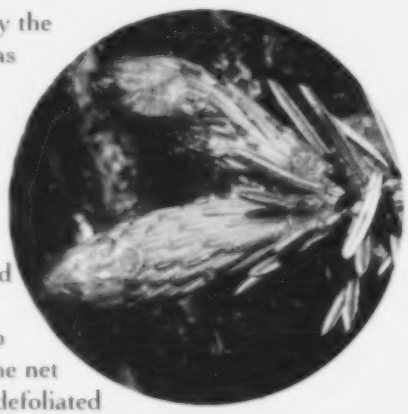

In the inventoried area of this region (south of the latitude 58° N), the gross defoliated area increased by 100% compared to 2004 (Table 2). The net spruce budworm-defoliated area decreased by 91%, compared to the defoliated area in 2004.

[2] Tom Hutchison, FHO, NE Region, personal communication

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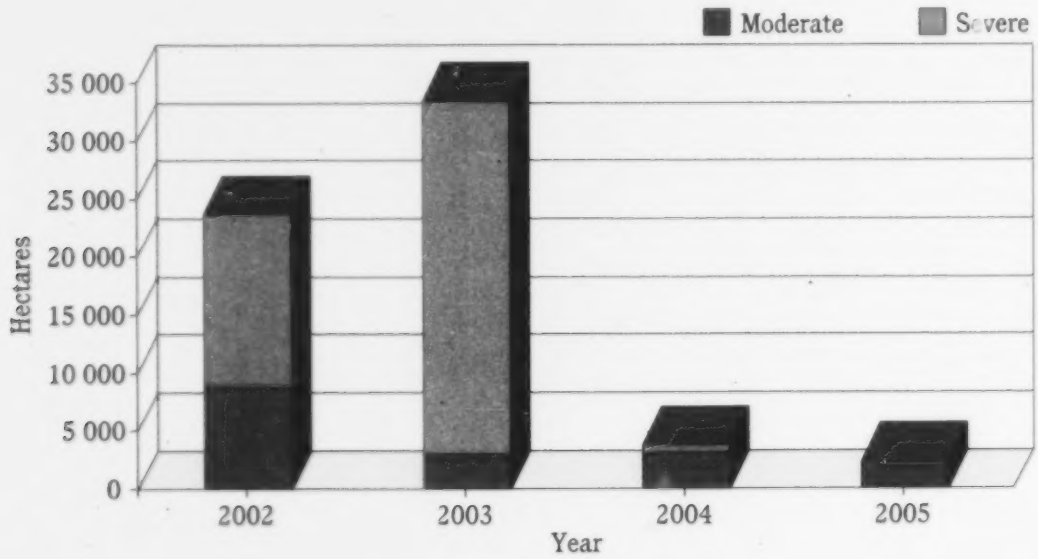


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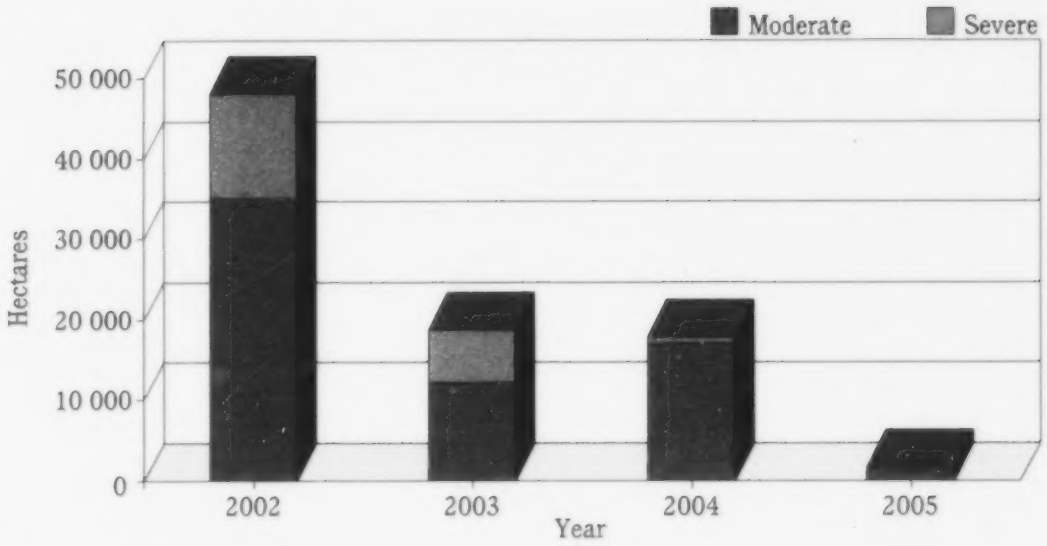


***Figure 5***
Net area (ha) of spruce budworm defoliation south of latitude 58° N in the Northeast Region in Alberta, 2002-2005.

**Northwest Corporate Region (NW)**

The Forest Health Officer carried out an aerial survey between August 8-10 to record the extent and severity of spruce budworm defoliation over the Lesser Slave (NW2), Peace (NW3) and Upper Hay (NW4) areas of this region. The extent of defoliation was recorded by digital sketch mapping with the use of a tablet personal computer combined with a Global Positioning System (GPS).

The results of this survey are shown on Figure 3. The spruce budworm defoliated an estimated net area of 8 440 ha in this region in 2005. This is an 8% decrease compared to the 9 152 ha defoliated in 2004 (Table 3). In the NW2 Area, an estimated 268 ha were moderately defoliated near Chipewyan Lakes. No defoliation was recorded in the NW3 Area. In the NW4 Area, 4 788 hectares were moderately defoliated (65% increase) and 3 384 hectares were severely defoliated (43% decrease) compared to figures in 2004. Most defoliation in this area was found along the Peace River, between John D'or Indian Reservation and Wood Buffalo National Park. An additional patch of moderate defoliation was observed along the Mikkwa River located northeast of Loon River.

Figure 6 shows the net areas of spruce budworm defoliation in this region in the last five years. The spruce budworm infestation in this region collapsed in 2004. The pattern of defoliation in 2005 was similar to that of 2004.

*Table 3*
Spruce budworm defoliation in the Northwest Corporate Region in Alberta by severity categories, 2004 vs. 2005

| Corporate Unit | Net Defoliation (ha) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2004 | | | 2005 | | | |
| | Moderate | Severe | Total | Moderate | Severe | Total | Change[a] |
| Lesser Slave Area (NW2) | 263 | 0 | 263 | 268 | 0 | 268 | 2% |
| Upper Hay Area (NW4) | 2 902 | 5 987 | 8 889 | 4 788 | 3 384 | 8 172 | -8% |
| Total | 3 165 | 5 987 | 9 152 | 5 056 | 3 384 | 8 440 | -8% |

[a] percent change between 2004 and 2005

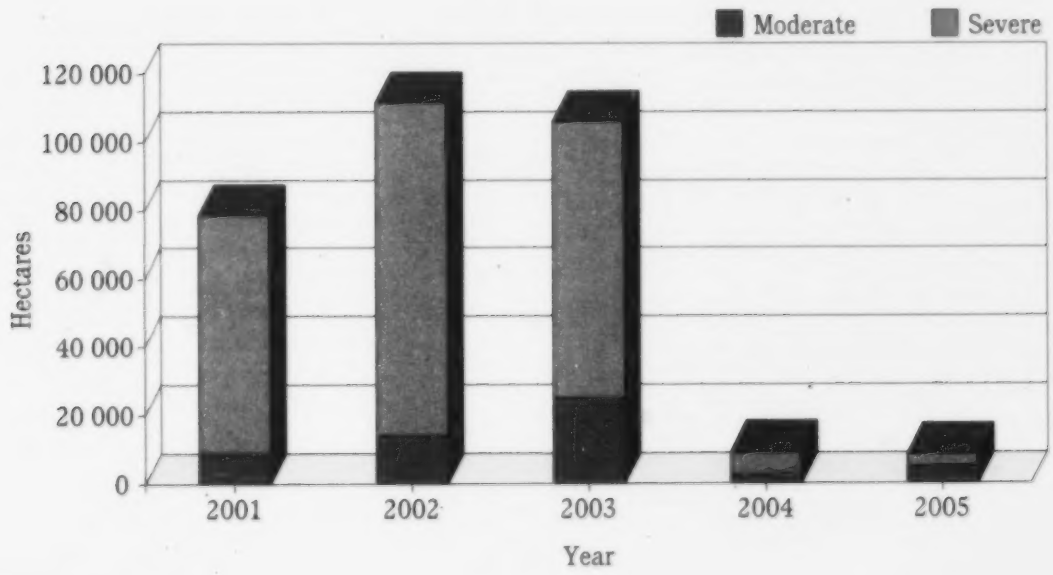


*Figure 6*
Net budworm-defoliated area by severity categories in the Northwest Region of Alberta, 2001-2005.

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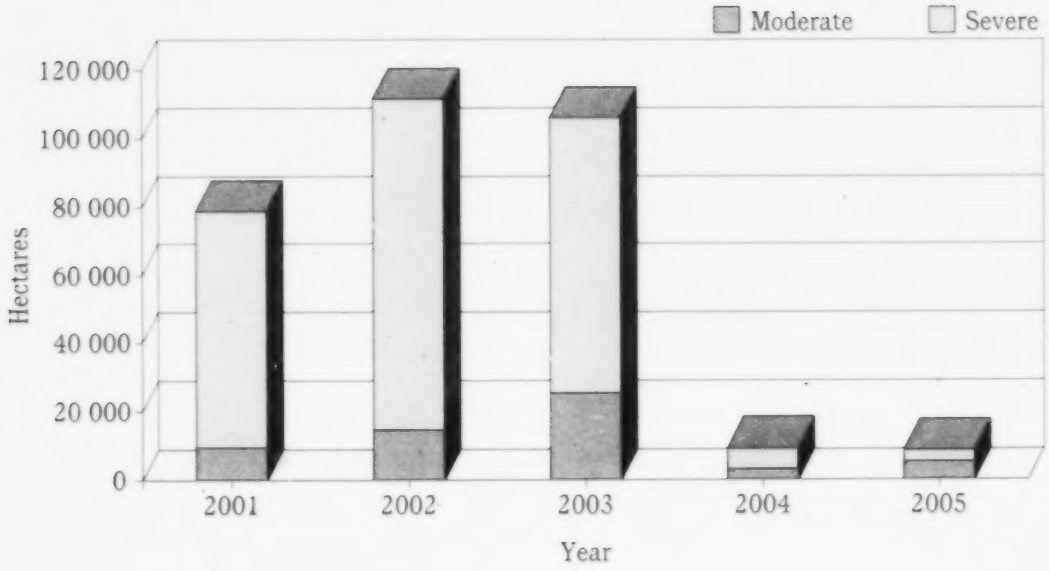



*Figure 6*
Net budworm-defoliated area by severity categories in the Northwest Region of Alberta, 2001-2005.

**Southwest Corporate Region (SW)**

There were no reports of spruce budworm defoliation in this region in 2005.

**Cypress Hills Inter-Provincial Park**

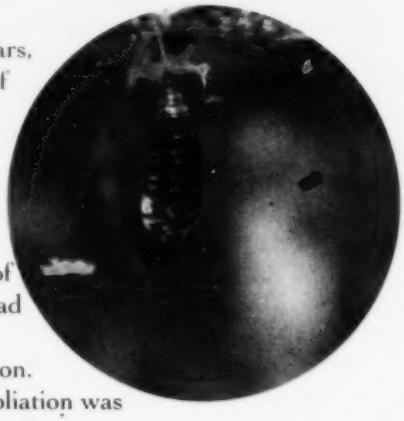
Although some spruce budworm pupae were collected during a field study, no spruce budworm defoliation was found in this park. Most pupal cases have been damaged and the survival ratio appeared to be low (Large and Weekes, 2005).

Federal Lands

**Wood Buffalo National Park**

Most of the defoliation in the area north of 58° N latitude was in Wood Buffalo National Park. This defoliation was of moderate intensity. It occurred along the drainages of Peace, Athabasca and Slave rivers (Figure 3). The extent of gross defoliated area within the park (excluding the defoliation fully in the Northwest Territories) was 39 084 hectares. Some areas in the south were not mapped due to weather conditions during the aerial survey.

Municipal Lands



In the past few years, the Municipality of Wood Buffalo has had an ongoing spruce budworm infestation in Fort McMurray. In 2005, some areas of the municipality had severe spruce budworm defoliation. However, this defoliation was not aerially surveyed[3].

## Western Spruce Budworm
***Choristoneura occidentalis* (Freeman)**

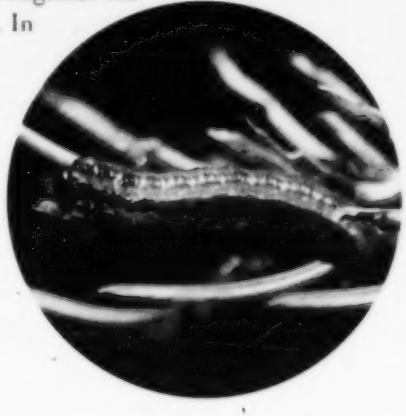
An aerial overview flight was carried out following a report received from the general public on severe defoliation of Douglas-fir stands in Porcupine Hills area of southern Alberta. The causative organism of this defoliation was tentatively identified as the western spruce budworm[4]. However, neither the infestation was mapped nor was the causative organism verified.

## Yellowheaded Spruce Sawfly
***Pikonema alaskensis* (Rohwer)**

The yellowheaded spruce sawfly (YHSS) continued to defoliate young white spruce growing on reclaimed oil and gas lands near Fort McMurray, Cold Lake and Bonnyville in northeastern Alberta. However, data on the extent and severity of these defoliations were not collected.

A perennial YHSS infestation on Cypress Hills Inter-Provincial Park continued to damage some ornamental white spruce at the townsite and near Elkwater Lake.

Yellowheaded spruce sawfly (YHSS) populations have increased dramatically to infest a large number of white spruce throughout the City of Edmonton. In 2005, the pest management operations staff treated 3 584 YHSS-infested trees in the city.



[3] Stephen Rice, Municipality of Wood Buffalo, personal communication

[4] Daniel Lux, Mountain Pine Beetle Coordinator, personal communication

## Bark Beetles

### Mountain Pine Beetle
***Dendroctonus ponderosae* (Hopkins)**

Provincial Crown Land

The results of the 2004 ground surveys with pheromone baits and the aerial overview surveys are described below. The details of the 2004/05 operational ground surveys for control are in the Mountain Pine Beetle Management Program section (page 23). The results of the 2005 ground surveys with pheromone baits and the aerial overview surveys are mentioned in the Forecast for 2006 section (page 41).

**2004 Ground Surveys to Detect MPB Presence by Using Pheromone Baits**

A two-component aggregation pheromone bait (Phero Tech Inc., B.C.) was used to monitor MPB presence in high-risk lodgepole pine stands in southwestern Alberta. The plot locations were readjusted in 2004 by removing plots located in stands where MPB is known to occur. The procedure for deploying these pheromone baits is described in "Mountain Pine Beetle Management Guide" (Kominek, 1999). The results of this survey are shown in Figure 7.

Northwest Corporate Region (NW)

In 2004, four plots with mountain pine beetle pheromone baits were established in the Smoky Area (NW1). Baited trees at two of these plots were attacked by the MPB (Figure 7). One of these plots located north of the Narraway River had 3 and 13 hits respectively on two baited trees; the other plot located north of the Wapiti River had 1, 4 and 5 hits respectively on three baited trees. None of the attacks was successful in producing progeny.

Southwest Corporate Region (SW)

*Southern Rockies (SW1) and Clearwater (SW2) Corporate Areas*

A total of 15 sites in the SW1 Area were baited in 2004. Trees at 10 of these baited sites had beetle hits ranging from 1-200 per tree. In addition, three non-baited trees also were attacked with hits ranging from 12-100 per tree. Six sites were baited in the SW2 Area. One of these sites had all three trees attacked with hits ranging from 2-19 per tree (Figure 7).

*Foothills Corporate Area (SW3)*

In 2004, fourteen sites with pheromone-baited trees were established in the SW3 Area. Only two sites had trees with beetle hits. One of the three sites (Jackpine/Spider) located in Willmore Wilderness Park (WWP) had all three trees attacked with hits ranging from 38-81 per tree; one non-baited tree at this site had a spill-over attack with 50 hits. The other two sites located in WWP did not have beetle hits.

Only one of the 11 sites (Bloodroot Creek) located outside WWP had beetle hits in 2004. Two out of three trees at this site had 72 and 54 hits respectively. The other 10 sites, including the site in Kakwa Wildland Provincial Park (relocated further downstream along the Lower Kakwa River in 2004) were not attacked (Figure 7).

Cypress Hills Inter-Provincial Park

In 2004, pheromone-baited trees at 4 out of 25 sites had beetle hits. Three of the attacked sites were located west of Willow Creek Road and the other was located at Nine Mile Coulee in the southeast corner of the park. The number of beetle hits ranged from 1-3 per tree.

2004/05 Aerial Surveys

The Forest Health Officers and a private contractor carried out aerial surveys over high MPB-risk forested areas of the province. These surveys covered mature pine forest along the eastern slopes of the Rockies extending from Kakwa Wildland Provincial Park in Smoky (NW1) Area in the north to the U.S. border in the south. The results of these surveys are shown on Figure 8.

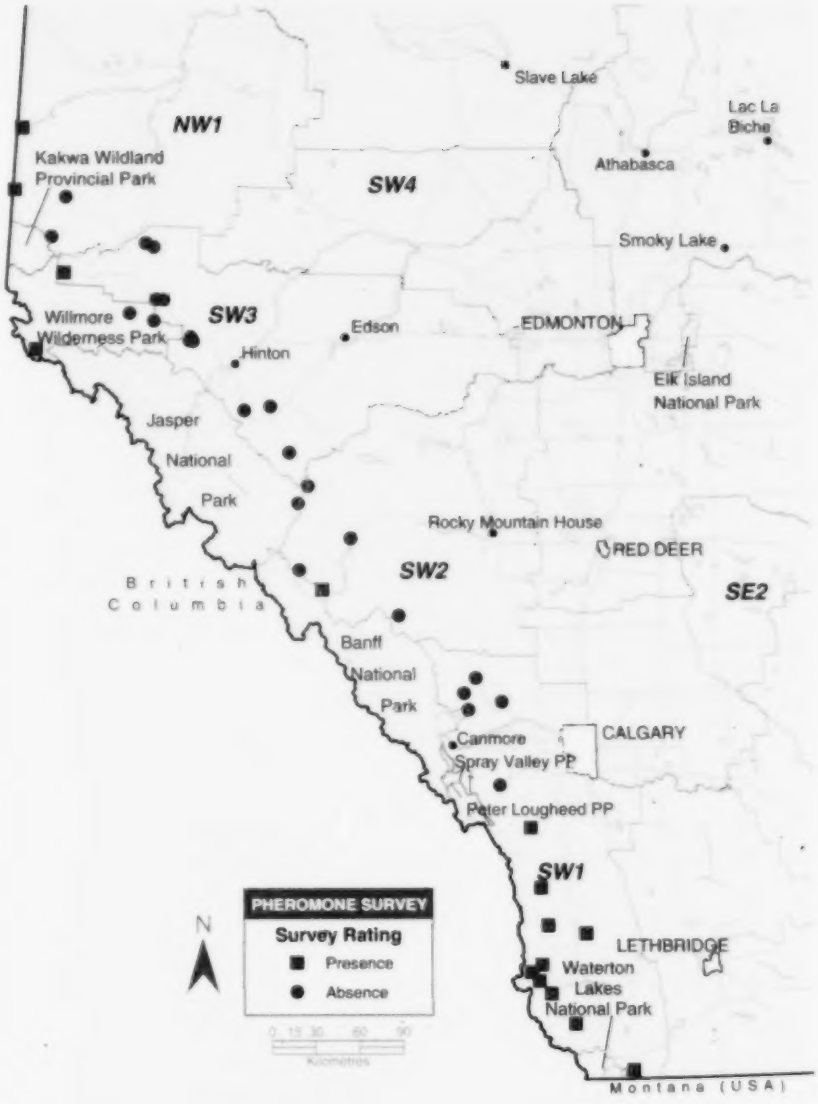



***Figure 7***
Presence/absence of mountain pine beetle hits on trees in pheromone-baited plots located in Alberta, 2004.

Northwest Corporate Region (NW)

Aerial surveys were carried out in the fall of 2004 over Kakwa Wildland Provincial Park to detect pine trees symptomatic of MPB infestations. These surveys indicated no trees symptomatic of MPB infestations on this park (Figure 8).

Southwest Corporate Region (SW)

*Southern Rockies (SW1) and Clearwater (SW2) Corporate Areas*

Pine trees symptomatic of the MPB were detected in the Bow Valley, south of Spray Lake, along the Oldman River and south of Crowsnest Pass during aerial surveys carried out between October 5-8, 2004 (Figure 8). The surveyors covered about 70% of the pine stands with high and extreme MPB-risk in these two corporate areas.

*Foothills (SW3) and Woodlands (SW4) Corporate Areas*

Pine trees symptomatic of the MPB were found along the Beaverdam Creek/Avalanche; Meadowland and the Casket creeks in Willmore Wilderness Park (WWP) during the initial aerial survey carried out in the fall of 2004 (Figure 8). However, hundreds of either red or fading trees were later observed on drainages of Fetherstonhaugh Creek, Muddywater River and Sheep Creek during a rotary-wing flight over WWP on June 28, 2005. This observation prompted another survey program that led to detection of a few thousand more suspected fading trees in WWP in July 2005.

***Figure 8***

Locations of suspected mountain pine beetle-killed trees detected during aerial surveys carried out in the fall of 2004.

## Federal Lands

### Banff National Park

Leo Unger (Canadian Forest Service, Pacific Forestry Centre), carried out aerial overview surveys over Banff National Park in July 2004. Approximately 5 000 suspected MPB-killed pines were mapped during these surveys. This is about a 25% increase compared to the number of suspected MPB-killed trees mapped in 2003. Major infestations were located in Healy Creek and Mount Norquay areas. Significant increase in tree kill was observed in Bow River Valley between Ranger Canyon and Castle Mountain, along the lower Spray River and near Aylmer Creek along Lake Minnewanka. The Fairholme Range was not mapped.

### Jasper National Park

Leo Unger reported mountain pine beetle activity in two areas of the Park in 2004. In the Upper Smoky River area about 30 faders were detected. Beetle activity was detected for the first time near Adolphus Lake in this area. The main area with beetle activity stretched from the West Gate to Jasper along the Miette River Valley. Along this stretch 125 beetle-killed trees were observed.

## Major Aspen Defoliators

The regional forest health officers and a contractor carried out aerial surveys to estimate the extent and severity of insect pest-caused aspen defoliation over the forested Crown land. Personnel from Canadian Forest Service and Parks Canada surveyed defoliation on Wood Buffalo National Park; the other national parks and provincial parks were not surveyed. Fixed wing aircraft were used in these surveys. Either a tablet PC loaded with digital maps of the survey area combined with a GPS, or hard copies of 1:250 000 scale maps were used to record extent and severity of defoliation during these surveys. The surveyors categorized aspen defoliation as light (<35%), moderate (35-70%) or severe (>70%).

In 2005, this defoliation was mostly caused by **forest tent caterpillar**, *Malacosoma disstria* (Hübner) and **large aspen tortrix**, *Choristoneura conflictana* (Walker). The results of these surveys are summarized in Table 4 and are shown on Figure 9.

The total gross area defoliated in 2005 was over 2.8 million hectares (Table 4). This is about a 3.5-fold increase compared to the gross defoliated area in 2004.

***Table 4***

The extent (ha) of insect pest-caused aspen defoliation in Alberta[a], 2004 vs. 2005

| Corporate Region | Gross area of defoliation (ha) | | | | | |
|---|---|---|---|---|---|---|
| | 2004 | | | 2005 | | |
| | Light | Moderate | Severe | Light | Moderate | Severe |
| Northeast | 5 182 | 105 | 0 | 2 753 | 5 035 | 40 173 |
| Northwest | 5 567 | 305 933 | 277 419 | 379 271 | 287 944 | 2 061 360 |
| Southwest | 15 773 | 19 848 | 2 983 | 16 347 | 7 442 | 18 062 |
| Total | | 632 810 | | | 2 818 387 | |

[a] National and provincial parks excluded

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| Total | | 632 810 | | | 2 818 387 | |

[a] National and provincial parks excluded

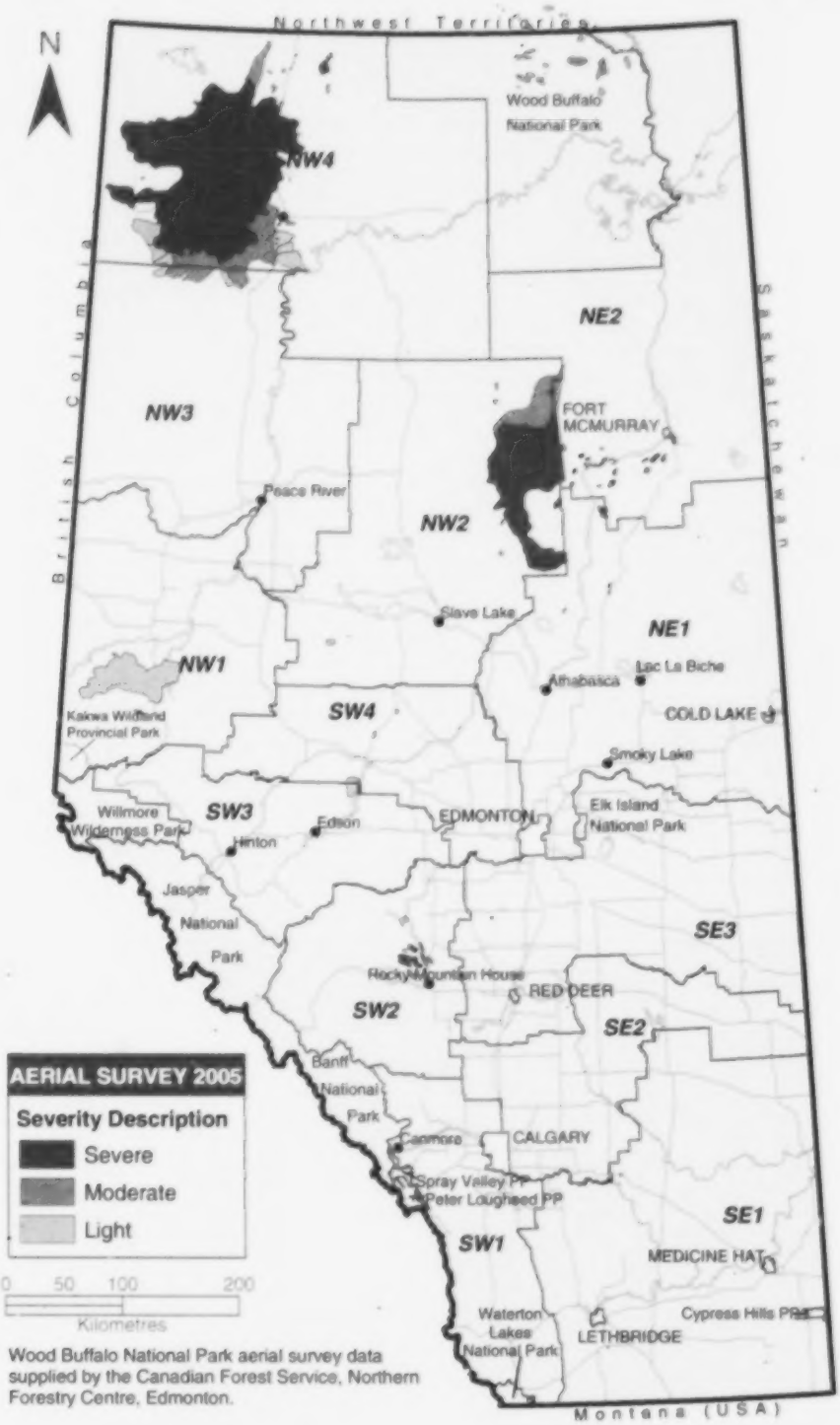



*Figure 9*
Spatial distribution of aerially visible insect pest-caused aspen defoliation on forest areas surveyed in Alberta, 2005.

### Northeast Corporate Region (NE)

Aerial overview surveys were carried out on July 4-6 and on July 20. A fixed wing aircraft (Cessna 206) was used for these surveys.

The **forest tent caterpillar** defoliated aspen along the Athabasca River on the Thickwood Hills area located southwest of Fort McMurray in the Waterways Area. A ground verification survey carried out on August 4 confirmed this observation. During this ground survey, aspen defoliation much more extensive than what was recorded during the aerial overview surveys was observed. This indicates an underestimation of aspen defoliation during the 2005 aerial surveys.

In the future it may be prudent to check the pheromone traps for signs of moth flight to ensure that aerial surveys are not carried out until defoliation is complete.

Some **large aspen tortrix**-caused damage was also observed in this region. However, aspen defoliation was ascribed to the **forest tent caterpillar**, which was the main defoliator.

The extent and severity of aspen defoliation in this region during 2002-2005 are shown on Figure 10. This figure shows a rather short-lived aspen defoliation caused by the **large aspen tortrix** in 2002-2003. This infestation collapsed in 2004. The modest increase in aspen defoliation in 2005 is due to the **forest tent caterpillar**. As indicated above, the extent of 2005 defoliation may be underestimated.

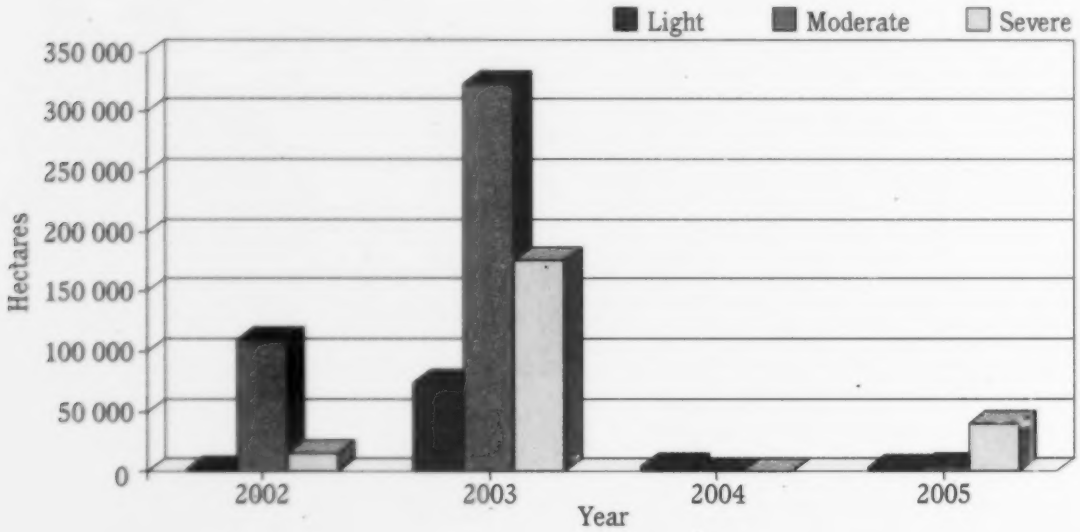



***Figure 10***
Extent and severity of insect pest-caused aspen defoliation in the Northeast Region of Alberta, 2002-2005.

### Northwest Corporate Region (NW)

The FHO carried out most of the digital sketch mapping of aspen defoliation between June 20-July 13; the remainder of mapping was completed on August 3. A tablet personal computer connected with a GPS unit was used for these surveys. The results of these surveys are shown on Figure 9.

The extent and severity of aspen defoliation in this region during 2001-2005 are shown on Figure 11. This figure shows a longer than usual large aspen tortrix defoliation that collapsed in 2004. The increase in aspen defoliation in 2005 is due to the forest tent caterpillar.

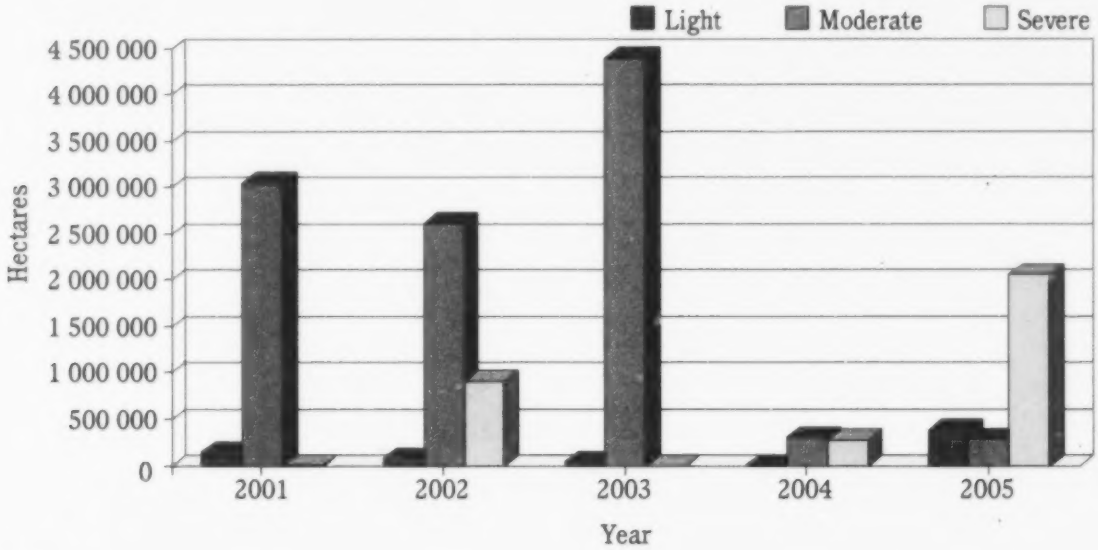
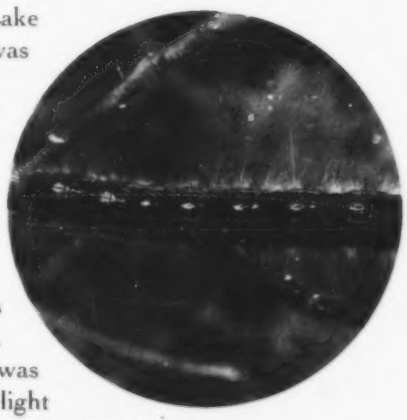


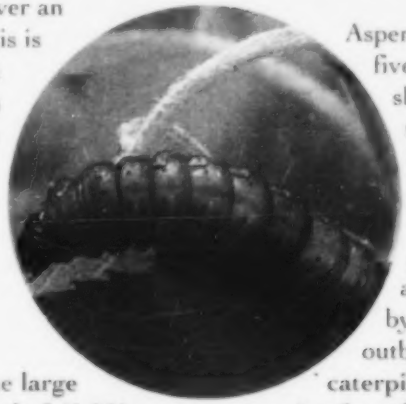

***Figure 11***
Extent and severity of aspen defoliation in the Northwest Region in Alberta, 2001-2005.

**Forest tent caterpillar** defoliation in this region was scattered over an estimated 2 501 574 ha. This is almost an eight-fold increase compared to the 287 244 ha defoliated in 2004. Most of this defoliation was severe.

There were two large patches of defoliation in this region. One large patch was scattered over an estimated 1 996 191 ha. Most of this patch was located in the Upper Hay Area with a small portion extending in to the Peace Area (Figure 9). This large patch extended over the areas of Chinchaga River, Rainbow Lake, Zama City, High Level, north of Paddle Prairie, Meander River, Steen River and Yates River. The other patch was located near Wabasca in the Lesser Slave Lake Area. This patch was scattered over an estimated 520 078 ha south of South Wabasca Lake, near Teepee Lake, Little Buffalo Lake and as further north as Chipewyan Lakes. In addition, there was a smaller patch of light defoliation in the Smoky Area (NW1).



The area defoliated by the **large aspen tortrix** further declined in 2005 compared to area defoliated in 2004. This defoliation was found scattered over an estimated gross area of 227 001 ha. This is a 25% decline compared to 301 675 ha defoliated in 2004. Areas of defoliation were found south of Grande Prairie in the Smoky Area and on Saddle Hills and south of High Prairie in the Lesser Slave Area.



## Southwest Corporate Region (SW)

Aspen defoliation, mostly caused by the **large aspen tortrix**, was scattered over a total of 41 851 hectares throughout this region in 2005 (Figure 9). More than half of this defoliation was in the Clearwater (SW2) Corporate Area.

Aspen defoliation in this region in the last five years is shown on Figure 12. This shows the collapse of large aspen tortrix populations in 2004. This infestation began in 1999 and continued for five years before collapsing in 2004. Historically, **large aspen tortrix** infestations last for about three years and are followed up by the **forest tent caterpillar** outbreaks. In 2005, some **forest tent caterpillar** larvae were observed in this region foretelling another outbreak in the near future.

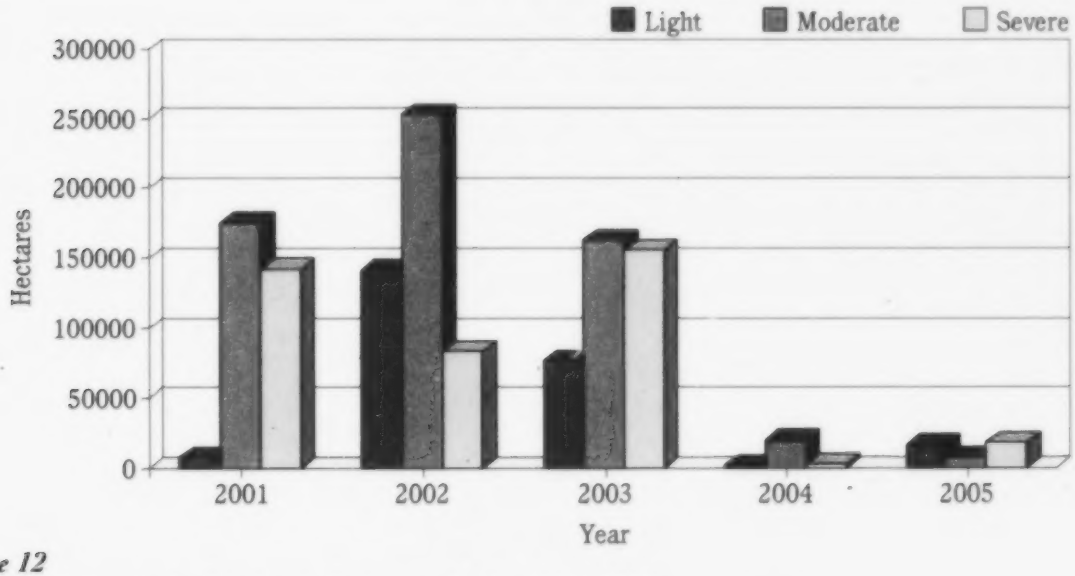


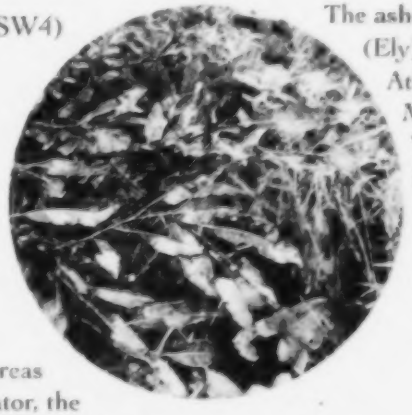

***Figure 12***
Aspen defoliation in the Southwest Corporate Region, 2001-2005.

### Southern Rockies (SW1) and Clearwater (SW2) Corporate Areas

The Forest Health Officer carried out aerial overview surveys on aspen defoliation from June 28-29 over the Southern Rockies (SW1) and Clearwater (SW2) areas. A fixed wing aircraft was used for these surveys. The results of these surveys are shown on Figure 9.

Aspen defoliation was scattered over an estimated gross area of 25 504 hectares. This is about an 8% decline compared to 27 792 hectares defoliated in 2004. The **large aspen tortrix** was the main defoliator of aspen in these two areas.

### Foothills (SW3) and Woodlands (SW4) Corporate Areas



The Forest Health Officer and a private contractor carried out an aerial overview survey on July 12 on aspen defoliation over the Foothills (SW3) and Woodlands (SW4) areas. The results of this survey are shown on Figure 9.

Aspen defoliation in these corporate areas was attributed to the dominant defoliator, the **large aspen tortrix**, although some **aspen two-leaf tier** *Enargia decolor* (Walker) damage was observed during the survey. The defoliation was confined to Whitecourt area. Defoliation was scattered over an estimated 16 347 ha. This is a 51% increase in defoliated area, compared to the 10 812 ha defoliated in 2004.

## Other Aspen Defoliators

The **aspen leafroller**, *Pseudoxentera oregonana* (Walsingham), damage was common in northern Alberta. In the Northwest Region, aspen leafroller was abundant in areas along the Peace River from British Columbia border to the Town of Peace River. In some areas up to 80% of the aspen leaves were infested with this pest. The **aspen leafroller** damage was widespread in the Northeast Region.

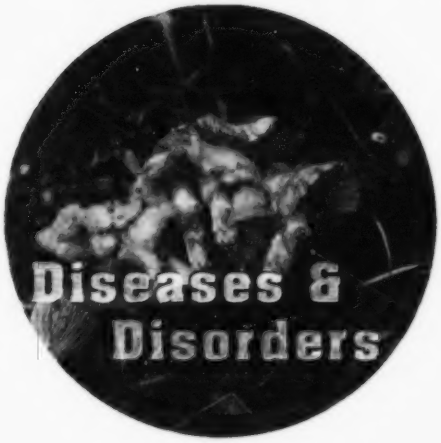
The **aspen two-leaf tier** was partly responsible for aspen defoliation in the northern part of the Southwest Region.

## Minor Insect Pests

Extensive areas of willow with **willow leafminer**, *Micrurapteryx salicifoliella* (Chambers) damage were observed in the Northeast region. Willow dieback was evident in the areas north of Wandering River and in the Waterways Area.

The **ash leaf cone roller**, *Caloptilia fraxinella* (Ely) infested some ash trees around Athabasca, Wandering River and Fort McMurray in the Northeast Region. The range of this pest appears to be increasing within the region.

# Diseases & Disorders




Many diseases have been reported to affect forest trees in Alberta. Needle casts and rusts, dwarf mistletoe, stem cankers and rusts, stem and root decay caused by fungi, cone rusts, seedling diseases, leaf rusts and blights are among the common diseases of forest trees. However, these diseases were not surveyed in 2005 and consequently, not reported here.

## Hypoxylon Canker

A substantial increase in the **hypoxylon canker** *Hypoxylon mammatum* (Wahl.) was observed on aspen in Cypress Hills Inter-Provincial Park. The infection was particularly severe near the Elkwater Townsite. Some aspen stands in the park were nearly 100% infected. The mature aspen in the park is showing advanced signs of decay.

## Hail Damage

Hail damaged an estimated 2 171 hectares of aspen in the Peace River Area of the Northwest Region. Aerial observation of this hail damage was confirmed by ground survey. The affected area was located along the Chinchaga Forestry Road, north of Manning. All broadleaf trees were completely stripped of foliage in the worst affected areas.

# Urban Forest Pests[6]

## Insect Pests

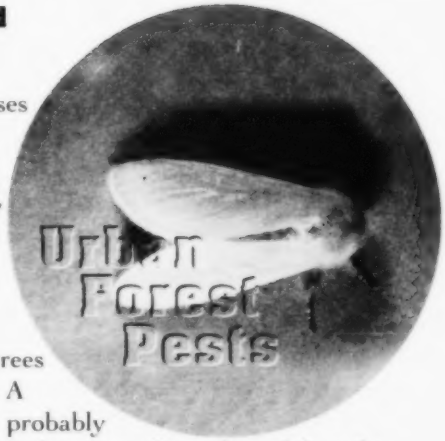
**Yellowheaded spruce sawfly** (YHSS) populations increased dramatically throughout the City of Edmonton. In 2005, the City of Edmonton staff treated 3 584 YHSS-infested white spruce. This pest problem is expected to exacerbate in the coming years.

The **satin moth**, *Leucoma salicis* (L.), numbers in Edmonton appeared to have increased in the past few years; as well as in their **parasitoid wasp**, *Cotesia* sp., which kept the satin moth increase to a minimum. The **apple maggot**, *Rhagoletis pomonella*, (a minor pest causing cosmetic damage) has become established in Edmonton area. No **gypsy moths**, *Lymantria dispar* (L.), were caught in pheromone-baited traps set up at various strategic locations around the city, in conjunction with the Canadian Food Inspection Agency (CFIA). The **larger boxelder leafroller**, *Archips negundana*, defoliated several Manitoba maples along the river valley. The populations of the **forest tent caterpillar**, **fall cankerworm** (*Alsophila pometaria*), and **amber-marked birch leafminer** (*Profenusa thompsoni*) also increased slightly. The **spiny ash sawfly**, *Euparophora parca*, was found in low numbers. The **ash leaf cone roller**, *Caloptilia fraxinella*, was widespread in the city. In many of the 27 neighbourhoods surveyed, an unidentified *Apanteles* sp. parasitized up to 20% of this caterpillar larvae.

The **European elm scale**, *Gossyparia spuria*, has become established in Edmonton. Spraying of dormant oil appears to have contained this problem. The **ash plant bugs**, predominantly *Tropidosteptes glaber*, were found at low population levels on green ash; on black ash *T. plagifer* was the common species. The populations of the **cottony psyllid**, *Psyllopsis discrepans*, decreased across the city.

The **western ash bark beetles**, *Hylesinus californicus*, killed many ash trees. Experiments have shown that the western ash bark beetle is killed if the infested wood chip piles are heated to over 50°C for at least an hour. The numbers of **red elm weevil**, *Magdalis armicollis*, diminished in the city.

## Diseases and Disorders




Ninety new cases of the **fungal wilt disease**, *Dothiorella ulmi*, were confirmed in Edmonton in 2005[7]; thirty-three of these trees were removed. A **fungal canker**, probably *Cytospora*, occurred on a small number of drought-stressed trees near the west end of the city. Cankers similar to those caused by *Fusicoccum* sp. were reported from a number of green ash trees in St. Albert.

In spite of a relatively wet year, the city lost more trees to drought than in previous years. The city up to now has lost a few thousand trees due to drought.

### Dutch Elm Disease[8]

Eight suspected elm samples from across the province, submitted to Dr. Tewari's laboratory for diagnosis, tested negative for *Ophiostoma ulmi* and *O. novo ulmi*, the pathogens that cause the disease. Alberta still remains free of Dutch Elm Disease.

In addition, the Society to Prevent Dutch Elm Disease (STOPDED) placed 422 pheromone-baited sticky traps in 113 cities, towns, villages and hamlets as well as 31 nurseries, 5 ports of entry to the province and 29 provincial parks and recreational areas. Overall, the number of **smaller European elm bark beetle**, *Scolytus multistriatus* (SEEBB) captured in the sticky traps has been declining in the past few years. In 2005, single SEEBB was trapped for the first time in the Town of Brooks and villages of Raymond and Forestburg. Seven SEEBB were captured in Calgary.[8]

6 Based on an unpublished report by M. Jenkins and M. Wartenbe of the City of Edmonton.

7 Confirmed by Dr. J.P. Tewari, University of Alberta

8 Based on an unpublished report by Janet Feddes-Calpas of STOPDED Society

# Mountain Pine Beetle Management Program

**A comprehensive program to manage the mountain pine beetle infestations in the province was undertaken in 2005. This program included education and awareness, prevention, monitoring, surveying, assessment and control operations aimed at controlling MPB populations.**

## Prevention

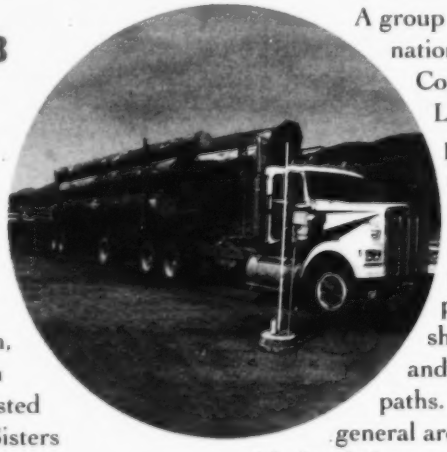
A ministerial order under the authority of Alberta Forests Act, RSA 2000 c. F-22 was issued on March 24, 2005 prohibiting transportation of pine logs or pine products with bark attached, within Alberta. This moratorium was in effect from May 1 to September 30.

With the assistance of Alberta Transportation - Inspection Services, SRD implemented a program geared to prevent transportation of pine logs or pine products with bark attached within the province. During this moratorium period five trucks loaded with pine material were refused entry into the province. In two of these cases, blue stain and pitch tubes were visible on logs.

## Programs to Control MPB Populations

### Municipal and Private Lands

Between January and April 2005, the Town of Canmore cut and burned 58 infested trees and the Municipal District of Bighorn removed 22 infested trees. In addition, 100 infested trees were removed from the Silvertip Golf Course and 72 infested trees were removed from the Three-Sisters Mountain Village.



### Federal Lands

Banff National Park[9]

Approximately 1 200 MPB-infested trees were removed from the park by hand fall and burn in late fall of 2004 and in early winter of 2005. In addition, park personnel set up about 500 aggregation pheromone baits to contain beetle populations within the infested area.

### Provincial Crown Land

Southwest Corporate Region (SW)

Southern Rockies (SW1) and Clearwater (SW2) Corporate Areas

2004/05 Ground Surveys - Walkthrough Surveys

A group of 25 volunteers representing national parks, Department of Community Development, Spray Lake Sawmill and the general public carried out walkthrough surveys over the MPB-suspected areas identified during the aerial surveys. Each volunteer team was given instructions on the survey procedure, a safety briefing, a map showing the designated survey area and a GPS Unit to track their survey paths. These survey crews identified general areas that needed to be followed up with detailed transect surveys.

[9] Jane Park, Banff National Park, Parks Canada, personal communication

### 2004/05 Ground Surveys - Transect Surveys

Contract crews and eight employees of SRD carried out transect surveys on areas delineated by the walkthrough survey crews. These areas were divided into four beetle survey zones. The transect survey crews identified 346 green attack trees in the Bow Valley (Figure 13) and six green attack trees near Blairmore in 2.5 months of surveying.

### Cut and Burn Infested Trees

Following the ground surveys from 2004 fall through the winter of 2005, the control crews cut 346 MPB-infested trees in the Bow Valley and burned those on the stumps. In addition, six infested trees were cut and burned in Blairmore area.

## Foothills (SW3) and Woodlands (SW4) Corporate Areas

### 2004/05 Ground Surveys

In the fall of 2004, three patches of MPB infested trees were found on Willmore Wilderness Park during an aerial survey. A four-person crew carried out ground surveys in late fall through winter of 2004/05 in the areas identified during aerial surveys. They

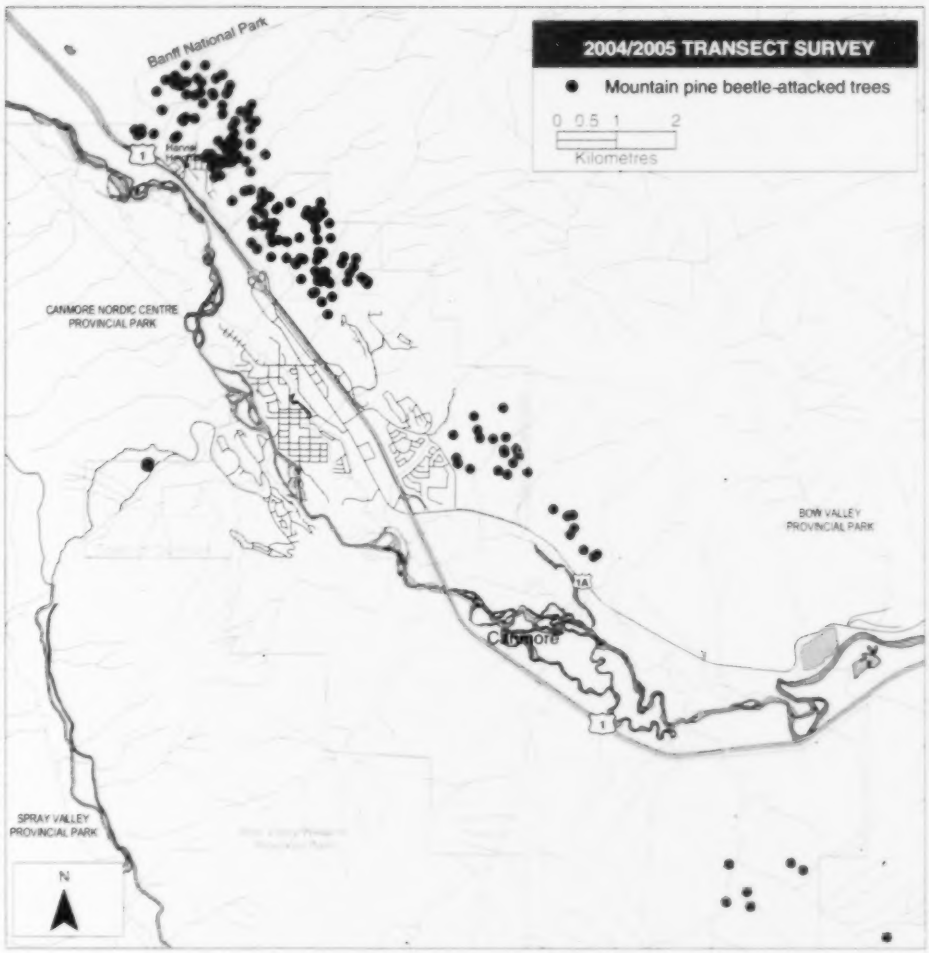



***Figure 13***
Mountain pine beetle-attacked trees detected during transect surveys of Bow Valley in Alberta, Winter 2004/2005.

detected 895 green attacks during this period (Figure 14 and Table 5).

During a subsequent flight in early summer of 2005 approximately 500 additional red and fading trees were detected along the Fetherstonhaugh Creek, Muddywater River and Sheep Creek drainages in Willmore Wilderness Park. This detection prompted a combined detection and control of several thousand infested trees (see next section for details).

### Cut and Burn Infested Trees

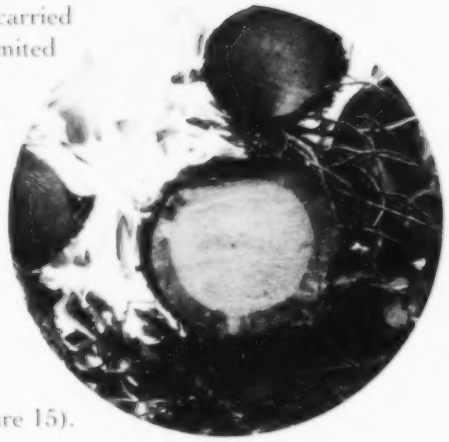
The four-person survey crew hired in the fall of 2004 cut and burned all 895 MPB-infested trees detected in this park (Table 5).

***Figure 14***
Results of the ground surveys carried out in fall 2004 to detect mountain pine beetle-attacked trees on Willmore Wilderness Park.

***Table 5***
Incidence and control of mountain pine beetle infestations in Willmore Wilderness Park, Alberta in fall 2004

| Site | Area (ha) | No. of Trees Controlled | Manpower Days Used |
|---|---|---|---|
| Beaverdam Creek | 160 | 398 | 175 |
| Meadowland Creek | 130 | 128 | 76 |
| Casket Creek | 130 | 369 | 241 |
| Total | 420 | 895 | 492 |

In addition to the above, in early summer of 2005 a control program was carried out simultaneously with the detection program in view of the extremely limited window that was available for control before emergence of MPB. This program was organized under an incident command system (ICS). At its peak, this operation had an incident command team with 20 overhead team members, nine contractors, 55 support personnel, 191 Type I, 8 Type II and 9 Type III firefighters. An average of 10 medium and intermediate helicopters were available for this operation. Two camps were set up to accommodate the project personnel.



Surveyors also found infested trees on Kakwa Wildland Provincial Park that were included in this control program (Table 6 and Figure 15).

Altogether, 5 257 trees were treated during this combined operation (Figure 15). The breakdown of this control treatment is shown on Table 6.

***Table 6***

Details of MPB detection and control on Willmore Wilderness Park and Kakwa Wildland Provincial Park in Alberta in 2005 summer

| Region/ Corp.Area | Type | Name | MPB Green/ Fader Trees Surveyed | Lodgepole Pine Cut & Burned | Whitebark Pine Cut & Burned | Total Treated |
|---|---|---|---|---|---|---|
| Foothills (SW3) | Provincial Crown Land | FMU E8 | 67 | 67 | 0 | 67 |
| | | FMU E10 | 184 | 184 | 0 | 184 |
| | Provincial Parks and Wilderness Areas | Willmore Wilderness Park | 4 592 | 4 302 | 81 | 4 383 |
| Smoky (NW1) | Provincial Crown Land | FMU G3 | 2 | 2 | 0 | 2 |
| | | FMU G6 | 1 | 1 | 0 | 1 |
| | Provincial Parks and Wilderness Areas | Kakwa Wildland Provincial Park | 658 | 597 | 0 | 597 |
| | FMA-Weyerhaeuser Canada Ltd. | FMU G3 | 21 | 21 | 0 | 21 |
| | | FMU G6 | 2 | 2 | 0 | 2 |
| TOTALS | | | 5 527[a] | 5 176 | 81 | 5 257 |

*FMA-Forest Management Agreement; FMU-Forest Management Unit

[a] Includes 270 infested trees that were pheromone baited for 2005 winter control operations.

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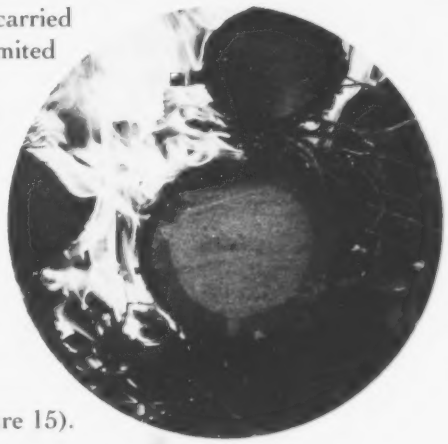

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| TOTALS | | | 5 527[a] | 5 176 | 81 | 5 257 |

*FMA-Forest Management Agreement; FMU-Forest Management Unit

[a] Includes 270 infested trees that were pheromone baited for 2005 winter control operations.

Use of Pheromone Baits

Pheromone baits were used to limit spread of emerging beetles in areas where time was running out to cut and burn green attack trees before beetle emergence. In each case, the largest healthy host tree closest to the infested tree was baited with a two-component MPB aggregation pheromone (Phero Tech Inc., B.C.). The intention was to attract and trap any beetles emerging from green attack trees in near by baited-trees. The baits were affixed onto the north side of the stem and the baited trees were marked with flagging tapes. These baited-trees were to be followed up by crews during the following round of control operations to check the baited-tree and surrounding host trees within a 100-metre circle for MPB infestations, remove the bait and treat those trees that have been attacked by the MPB.

Under this program, 1 017 pheromone baits were deployed along the Sheep Creek, Fetherstonhaugh Creek, Muddywater River, Pauline Creek, Meadowland Creek and Jackpine River (Figure 15) in WWP. These included spot baiting near 209 individual infested trees that could not be treated before MPB emergence. As well, line baiting by establishing several lines of trees with pheromone-baits across the valleys was used to trap MPB flying into Willmore Wilderness Park.

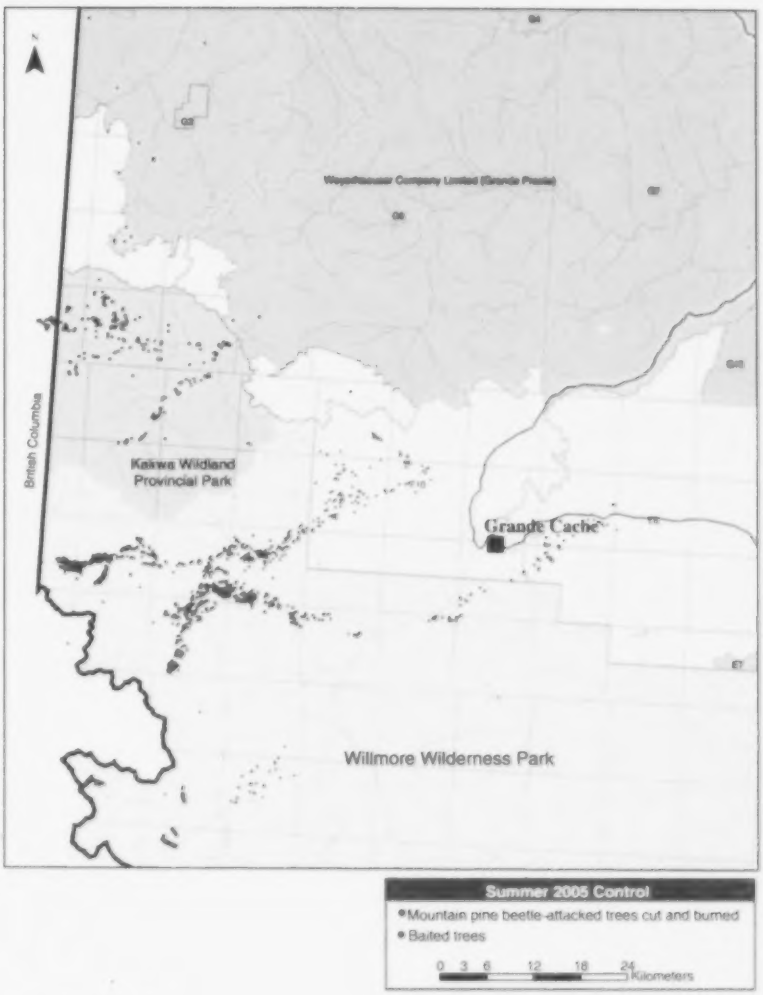



*Figure 15*
Mountain pine beetle-attacked trees cut and burned and locations of pheromone baited trees on Willmore Wilderness Park in Alberta, summer 2005

## Northwest Corporate Region (NW)

### 2004/05 Ground Surveys

Ground surveys to detect current attacks (green attacks) of MPB were carried out concurrently with the 2005 control program on Kakwa Wildland Provincial Park. Crews were dispatched to those sites where faders were detected during aerial surveys carried out in 2005 summer. These crews surveyed mature pines within a 100-metre circle around each fader to detect green attacks. Altogether, these crews detected 658 attacked trees on Kakwa Wildland Provincial Park.

### Cut and Burn Infested Trees

The surveyed trees in Kakwa Wildland Provincial Park were cut and burned in conjunction with the WWP control operation carried out in the summer of 2005 (Figure 15 and Table 6). For further details, see the Southwest Corporate Region- Foothills (SW3) and Woodland (SW4) Corporate Areas section.

In addition, pheromone spot baiting was used to trap beetles emerging from 61 infested trees that could not be harvested before MPB emergence. Altogether 85 pheromone baits were deployed in Kakwa Wildland Provincial Park.

# Forest Invasive Alien Plants

## Provincial

**In 2005, SRD followed the direction outlined in its *Invasive Plant Strategy* to more effectively address the impacts of invasive plants in partnership with others.**

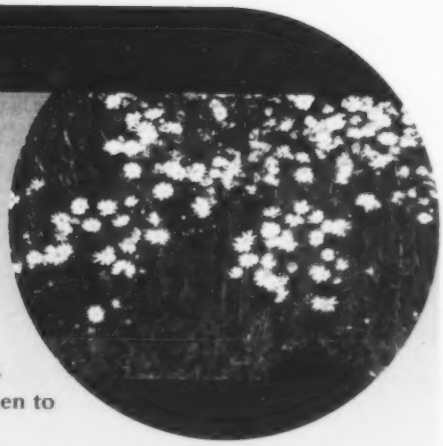
### Invasive Alien Species Working Group

SRD facilitated the establishment of the Interdepartmental Invasive Alien Species Working Group (Working Group). Under the direction of the Alberta Biodiversity Steering Committee, the Working Group will undertake to:

- Coordinate, align, and where possible consolidate Government of Alberta legislation, policies, programs, communications, and partnerships towards addressing impacts of invasive alien species.
- Develop a risk management framework and an assessment tool to minimize impacts of Alberta's current and potential invasive alien species.
- Provide advice and support towards the Government of Alberta's implementation of the National Invasive Alien Species Strategy, action plans and other related federal legislation, policies and programs.

The Working Group commenced to develop an Invasive Alien Species (IAS) Risk Management Framework. The framework is viewed as a systematic process and decision-making tool that allows a proactive, cost-effective, and consistent approach to address the impacts of IAS either threatening to enter or currently established in Alberta.

The framework will enable the provincial government and potentially other stakeholders to quantitatively identify and prioritize alien species by their likelihood to establish, spread and adversely impact Alberta's economic base, social values, natural resource productivity and biodiversity. Once the IAS are identified and prioritized based on the level of threat, decisions can be made on what



actions, if any, need to be taken to prevent their introduction and/or spread.

The framework consists of four incremental stages.

1. Screening and identification of alien species of potential or existing threat;
2. Systematic and quantitative assessment of the likelihood of alien species to establish, spread and create adverse impacts to Alberta's economic base, social values, natural resource productivity and biodiversity;
3. Utilize the risk assessment results to make strategic management decisions; and,
4. Enhance various communications.

The Working Group has taken early action on the second stage of the framework, i.e., the development of an IAS risk assessment tool. One initial focus of the tool will be the assessment of invasive plant risks. The first version of the tool will be completed in the spring of 2006, and will then be reviewed, tested and possibly refined.

### Education and Awareness

With regard to invasive plant education initiatives in 2005, SRD in conjunction with Alberta Community Development worked to develop educational signs to be placed at a number of recreational staging areas. The signs will provide information about the impacts of invasive plants, methods to control their introduction/spread, and will feature a few invasive plants common to a particular area. The signs will be posted in the spring/summer of 2006. SRD also continues to contribute to the initiatives of the

# Forest Invasive Alien Plants

## Provincial

In 2005, SRD followed the direction outlined in its *Invasive Plant Strategy* to more effectively address the impacts of invasive plants in partnership with others.

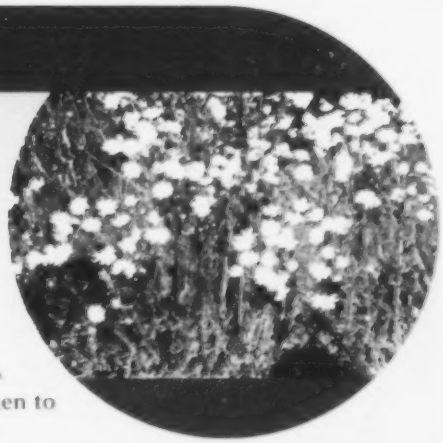
### Invasive Alien Species Working Group

SRD facilitated the establishment of the Interdepartmental Invasive Alien Species Working Group (Working Group). Under the direction of the Alberta Biodiversity Steering Committee, the Working Group will undertake to:

- Coordinate, align, and where possible consolidate Government of Alberta legislation, policies, programs, communications, and partnerships towards addressing impacts of invasive alien species.
- Develop a risk management framework and an assessment tool to minimize impacts of Alberta's current and potential invasive alien species.
- Provide advice and support towards the Government of Alberta's implementation of the National Invasive Alien Species Strategy, action plans and other related federal legislation, policies and programs.

The Working Group commenced to develop an Invasive Alien Species (IAS) Risk Management Framework. The framework is viewed as a systematic process and decision-making tool that allows a proactive, cost-effective, and consistent approach to address the impacts of IAS either threatening to enter or currently established in Alberta.

The framework will enable the provincial government and potentially other stakeholders to quantitatively identify and prioritize alien species by their likelihood to establish, spread and adversely impact Alberta's economic base, social values, natural resource productivity and biodiversity. Once the IAS are identified and prioritized based on the level of threat, decisions can be made on what



actions, if any, need to be taken to prevent their introduction and/or spread.

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Alberta Invasive Plants Council. In 2005 the Council held a well-attended workshop in Red Deer focusing on the theme of cooperative invasive plant management.

## Regional

### Northeast Corporate Region (NE)

In the Northeast Region, education and awareness remained the top priority of the invasive plant program. The second priority was to establish some control projects, and the third was to continue with the development of a comprehensive inventory of invasive plants in the Northeast Region.

#### Education and Awareness

Three Regional Invasive Plant Management Working Group sessions were conducted in Athabasca and Ft. McMurray. During the formal presentation in the two fall meetings, information was presented dealing with both invasive plants currently present and those that may be of concern in the near future. Also presented at the meetings was an overview of the 2005 Northeast Region invasive plant program.

A formal presentation was made for landfill and waste transfer site operators within the County of Athabasca. This session concentrated on invasive plant identification, proper handling/disposal of picked plants, and the impact invasive plants can have on the environment.

Interactive presentations and short field tours were given to campers at the Long Lake Junior Forest Wardens (JFW) Camp and at the JFW National Campout. Also, an information booth was set up in conjunction with other PLFD programs at the Lac La Biche Centennial Day Celebration. Brochures, booklets and other pertinent information regarding invasive plants were available to the public in addition to the opportunity to discuss concerns with Forest Health staff.

Whenever possible, when SRD crew was out conducting invasive plant inventories, other workers out in the field were approached to provide a "teachable moment" on invasive plants management. This spur of the moment approach seemed to be generally positive and allowed for a rapport to be developed at a common level between government and industry. This same approach was also used with recreational users (such as campers, off-highway vehicle operators, fishermen etc.) resulting in increased knowledge of invasive plant issues both at a local and provincial scale.

#### Surveys and Control

Inventory priority was placed upon the forested Crown land not currently under disposition. As well, there were follow-up surveys on previously known infestations. Surveying occurred to a lesser extent on oil/gas and timber dispositions.

A relatively higher percentage (87%) of the 373 sites inventoried in 2005, had invasive plant infestations (in comparison to 62% in 2004). The severity of infestation at these sites varied from trace (48%), low (28%), moderate (15%) to high (9%); the comparative numbers in 2004 were 37%, 28%, 19% and 16% respectively.

On the 325 sites that had invasive plants, 87 (27%) had multiple species.

The frequency of species varying regionally was consistent with 2004 and 2003 results - Canada thistle[10], oxeye daisy and tall buttercup were primarily found in the southern part (Lac La Biche area) of the Northeast Region. Scentless chamomile, common tansy and perennial sow thistle were scattered throughout the entire region. Perennial sow thistle is still extremely prevalent along most roads, to such an extent that many individual infestations were not recorded.

[10] See Appendix II for scientific names of invasive plant species.

Invasive plant species in descending frequency were:

- Common Tansy - 38.4%
- Scentless Chamomile - 21.8%
- Perennial Sow Thistle - 17.6%
- Tall Buttercup - 8.6%
- Canada Thistle - 6.9%
- Oxeye Daisy - 5.6
- White Cockle - 1.2%

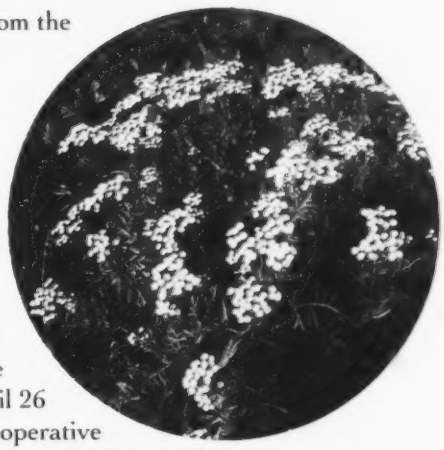
Note: In 2005 there was a deliberate emphasis on recording common tansy infestations along the Athabasca River north of Ft. McMurray.

Invasive plant inventories were conducted along various locations of the Pembina, Calling, Rock Island and Athabasca Rivers. Along the Athabasca River, surveying occurred from the southern edge of the forested Crown land (Twp 69, Rge 18, W4) downstream to the old Pelican Settlement Cabin (Twp 78, Rge 18, W4). As well, the Athabasca River was surveyed north of Ft. McMurray. In a majority of locations along all of the watercourses, common tansy was found in quantity. As well, Canada thistle and perennial sow thistle were also found at these remote locations.

Hand picking, digging or mowing of different invasive plant species occurred at 80 locations. The primary target species was scentless chamomile, and others controlled included common tansy, Canada thistle, oxeye daisy, tall buttercup, perennial sow thistle and white cockle. The control actions taken on these infestations were done regardless of land use type or who the disposition holder was, if any.

## Northwest Corporate Region (NW)

In 2005, the Smoky (NW1), Peace (NW3) and Upper Hay (NW4) areas continued their invasive plant management programs. The main priority in these areas was to detect noxious and restricted invasive plant species within targeted survey areas, and to notify those stakeholders whose dispositions contained the invasive plants. A second priority was to ensure that disposition holders were complying with control notifications from the previous year.



### Education and Awareness

An invasive plant awareness workshop was held in Grande Prairie on April 26 through the cooperative efforts of local municipalities and the Public Lands and Forests Division. The attendance was at a record level and plans are being made for another workshop this spring.

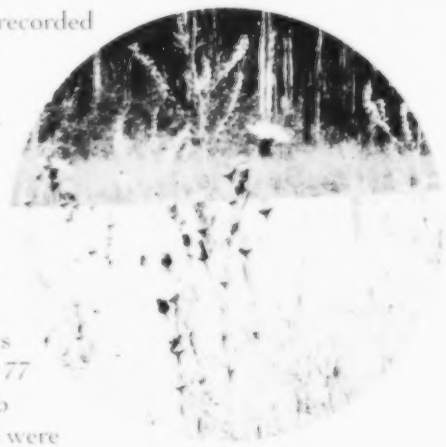
### Surveys and Control

Within the Smoky (NW1) Area, invasive plant surveys were conducted at 92 sites between mid-June and September by SRD staff. The most prevalent species found was Canada thistle, which was recorded on 39.1% of the sites. Other species found were perennial sow thistle, scentless chamomile, oxeye daisy, common tansy, bull thistle and nodding thistle. Multiple species were found on 7 (7.7%) of the 92 sites. Twenty (21.7%) of the 92 sites were clean of any invasive plants.

A number of small control programs for Canada thistle continued within three areas of the Smoky Area in 2005. A contractor was hired to treat a number of significant infestations on the Dobbin Grazing Lease and two smaller infestations on vacant crown land (Canyon Creek and an abandoned gravel pit). Tordon 101® and Arsenal® were used at an application rate of 7.0 litres per hectare.

Within the Upper Hay (NW4) Area, SRD staff conducted 540 invasive plant surveys, an impressive number, in July and August. The most prevalent species found was perennial sow thistle, which was recorded on 382 (70.7%) of the sites. Other species recorded were scentless chamomile, toadflax, oxeye daisy and Canada thistle. Multiple species were found on 93 (17.2%) of the 540 sites, and 106 (19.6%) of the 540 sites were clean of any invasive plants.

Within the Peace (NW3) Area, surveys were completed between mid-June and September by SRD staff, as well as staff from the municipalities of Northern Sunrise County and Northern Lights. There were 499 sites inspected in total. The most prevalent species found was perennial sow thistle, which was recorded on 228 (45.7%) of the sites.



Other species recorded were scentless chamomile, Canada thistle, oxeye daisy, tall buttercup, toadflax and common tansy. Out of the 499 sites, multiple species were found on 77 (15.4%) and no invasive plants were found on 156 (31.3%) sites (Table 7).

*Table 7*
Occurrence of invasive plant species on inspected sites in the Northwest Corporate Region, 2005

| Species Found | Corporate Areas | | |
|---|---|---|---|
| | Smoky (NW1) | Peace (NW3) | Upper Hay (NW4) |
| Clean | 20 (21.7%) | 156 (31.3%) | 106 (19.6%) |
| Bull thistle | 3 (3.3%) | 0 | 0 |
| Canada thistle | 36 (39.1%) | 97 (19.4%) | 4 (0.7%) |
| Nodding thistle | 1 (1.1%) | 0 | 0 |
| Oxeye daisy | 2 (2.2%) | 1 (0.2%) | 2 (0.4%) |
| Perennial sow thistle | 2 (2.2%) | 228 (45.7%) | 382 (70.7%) |
| Scentless chamomile | 25 (27.2%) | 105 (21.0%) | 136 (25.2%) |
| Tall buttercup | 0 | 3 (0.6%) | 0 |
| Common tansy | 3 (3.3%) | 1 (0.2%) | 0 |
| Toadflax | 0 | 2 (0.4%) | 3 (0.4%) |

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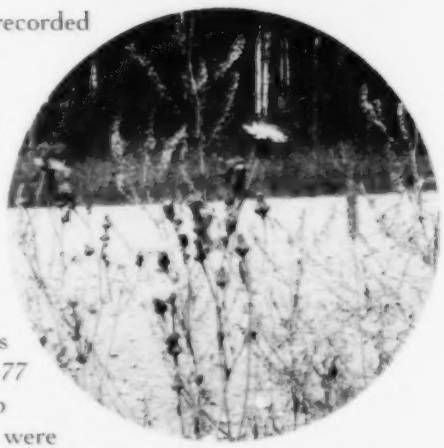

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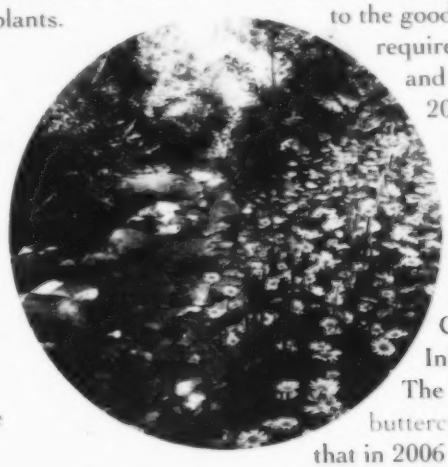
| Toadflax | 0 | 2 (0.4%) | 3 (0.4%) |

## Southwest Corporate Region (SW)

### Southern Rockies (SW1) & Clearwater (SW2) Corporate Areas

In southern Alberta, a very wet summer limited the control activities of the invasive plant program in 2005. Control work was delayed until rain and flooding was over in June. Control access was disrupted for most of the season. Wet weather persisted off and on through August. The season overall was somewhat cool, but not so cold as to restrict plant growth. The moisture provided excellent germinating conditions for invasive plants.



In 2005, the invasive plant program objectives for the SW1 and SW2 Forest Areas were as follows:

- Eradicate restricted weed infestations
- Contain and control (reduce abundance & density) noxious weed infestations
- Control and eradicate isolated noxious weed infestations where feasible
- Reduce herbicide costs and impacts on the environment
- Maximize stakeholder participation in cooperation, prevention, treatment, and inventory
- Increase invasive plant awareness and stewardship of public lands through increased awareness
- Protect economic and ecological values of public lands from the damage caused by invasive plants

The following are priority areas that were selected for invasive plant surveying and control in 2005:

1. Co-operative management areas.
2. Identified recreation areas on SRD lands.
3. All other vacant crown land not under disposition.

Approximately 43% of the budget was allotted to the SW1 Area, 29% to SW2 Area, and 5% was allotted for education. For the second year in a row, the Forest Protection Division (FPD) provided funds for invasive plant survey and control in the 2003 Lost Creek Fire area.

### Education, Awareness and Co-operative Initiatives

In the SW2 Area, the Owl River Road co-operative spray project in 2004 achieved excellent control of the tall buttercup that previously dominated the area. Due to the good residual control, the project area required only touch-up control by SRD and the leaseholder participants in 2005.

A new co-operative initiative went forth in the Rig St. area west of Sundre (SW2). The area comprised about two townships and involved 10 leaseholders and Clearwater County (on behalf of Alberta Infrastructure and Transportation). The primary target plants were tall buttercup and wild caraway. It is hoped that in 2006 this co-operative control area can be extended eastward beyond the forest reserve boundary.

In the SW1 Area, the Municipal District of Ranchland as the PLFD contract sprayer, conducted co-operative spraying with Devon Energy Corp.

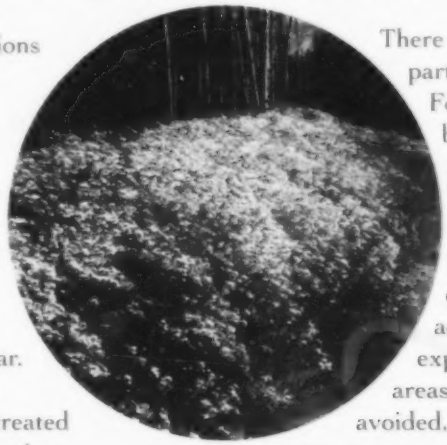
### Surveys and Control

Herbicide applications in the Rig St. area (SW2) began once the land dried out after wet weather. The boundaries of this co-operative control area were: the Clearwater River, south to the James River, and east from the Forestry Trunk road to the Forest Reserve boundary.

Following the Rig St. control operation, the focus shifted to touch-up herbicide applications on the Owl River co-operative and recreation staging areas west

of the Trunk road (Cut Off Creek, Peppers Lake, Hummingbird, Onion Lake, Eagle Lake). Many invasive plants are introduced into these and other backcountry areas via contaminated hay and manure, in addition to other traffic. Recreational actions of all kinds then unknowingly spread these invaders further along trails. Another attempt was made this season to thoroughly treat backcountry infestations in the Blackstone/Wapiabi areas with herbicide. The tall buttercup infestation of Nelson Flats was missed again because of high water.

In Kananaskis Country, ample moisture was likely the cause for resurgence in field Scabious. The area was thoroughly treated with an herbicide and hopefully will look better in 2006. Sites in the MacLean Creek area where infestations persisted in the past have been drastically reduced.



The presence of tall buttercup has increased significantly just south of the Highwood Junction and also in the north Livingstone area. Some of the Livingstone infestations were treated with an herbicide and the remaining will be dealt with next year. Farther south, the Trunk Road and adjacent pipelines were thoroughly treated for invasive plants as part of co-operative management with Devon Energy Corp. To the west, the Atlas Haul Road area remains badly infested with oxeye daisy among other species. The oxeye daisy infestation is beyond control, and containment is the only option in the area for the time being. The Racehorse Watershed into the Oldman River remains infested with oxeye daisy.

Public Lands and Forests Division and Forest Protection Division co-funded invasive plant species management in the Castle Area where containment is the control strategy. Survey and treatment of the fireguards serve as containment lines on the south side of the fire. Nearly all salvage-logged areas that were clean previously have rebounded with native growth. Recreation trails in the west Castle Area extending to the British Columbia border were surveyed and treated. The south Castle still has small isolated infestations. One exception is an explosion of oxeye daisy around the Drywood Creek Bridge near the Shell compound. A co-operative project with Shell at this site will be pursued in 2006.

The Beaver Creek area remains the most heavily infested of the Porcupine Hills; however the area looks better every year. This is likely due to high recreational activity. Removing the bolting stalks of hound's-tongue continues to be an effective control component. A proposed biocontrol release in the area had to be postponed until 2006.

There are two invasive plants that are of particular concern in the region. Foremost is wild caraway, which has been spreading throughout the forested Crown land. This invasive plant poses significant threat to wildlands, as it seems to be very tolerant of a wide range of growing conditions. Treatment of poorly accessible, isolated infestations is expensive. In ecologically sensitive areas, where use of residual herbicides is avoided, wild caraway can take several seasons to control. The second invasive plant of concern is orange hawkweed, which is increasing in numbers where it is currently present. This plant can rapidly colonize a site by vegetative reproduction.

### Foothills (SW3) & Woodlands (SW4) Corporate Areas

### Education, Awareness and Co-operative Initiatives

In the SW3 area, cooperation with industry stakeholders was mainly voluntary. The companies that participated were expected to submit and follow an invasive plant control strategy. Companies were asked to monitor their leases for invasive plants, record survey information and follow up with control

activities. The records were then submitted to SRD for input into the database. The overall compliance and record completion by the companies have been satisfactory.

## Surveys and Control

In the SW4 area invasive plant surveyors inventoried over 500 sites during the 2005 season. The main species recorded were oxeye daisy, scentless chamomile, Canada thistle, toadflax, common tansy, perennial sow thistle and tall buttercup. One other species that was found in many different areas was the bull thistle. Although this species is currently not categorized as a nuisance, noxious or restricted weed, it is thought to have the potential to become a large issue if not addressed.

In the SW3 area, survey and control operations focused on primarily on the area north of Edson (Table 8). The invasive plants in the area include Canada thistle, oxeye daisy, scentless chamomile, toadflax, common tansy and tall buttercup. The most common invasive plants found in the north Edson area were scentless chamomile and oxeye daisy. See Figure 16 for frequency of occurrence of invasive plants on inspected sites in this area.

*Table 8*
Invasive plant control sites in the SW3 Area in 2005

| Site # | Site | Dates of Control | Type of Control | Type of Weeds Controlled |
|---|---|---|---|---|
| 1 | Old mill (NE 8 51 10 5) | Jul-05 | Sprayed | Scentless chamomile |
| 2 | Reclaimed well (SE 3 50 10 5) | Jul-05 | Sprayed | Oxeye daisy |
| 3 | Triumviante Road Cutblock (SE 4 51 10 5) | Jul-05 | Sprayed | Common tansy, tall buttercup, oxeye daisy, Canada thistle |
| 4 | Pedley Gravel Pit (NW 10 52 24 5) | Jul-05 | Sprayed | Perennial sow thistle, oxeye daisy |
| 5 | Gravel Pit by Entwistle (SW 8 53 7 5) | Jul-05 | Sprayed | Tall buttercup, oxeye daisy, Canada thistle |
| 6 | Edson Warehouse | Aug-05 | Sprayed | Oxeye daisy |
| 7 | Gregg Cabin (SE 23 49 24 5) | Jul-05 | Sprayed | Tall buttercup |
| 8 | McLeod Group Camp | Jul-05 | Picked | Oxeye daisy |

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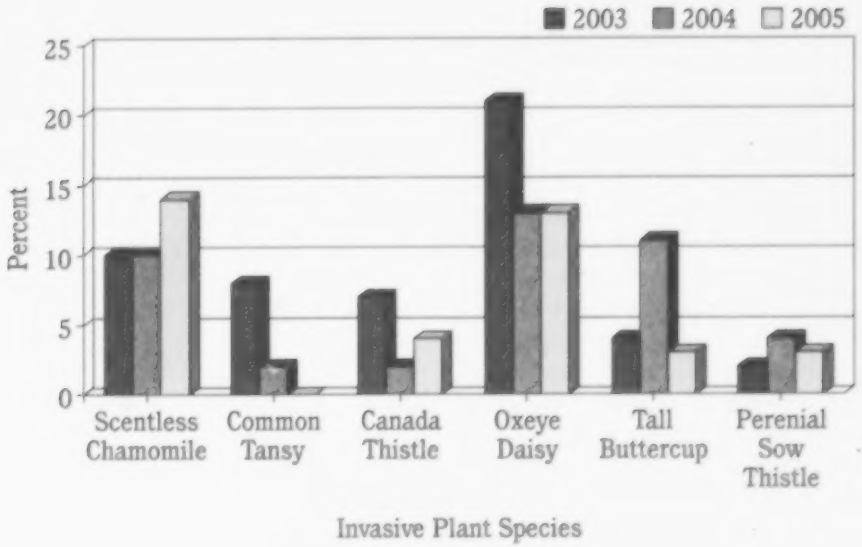


***Figure 16***
Frequency of invasive plant species occurrence on inspected sites in the north Edson area in Alberta between 2003 - 2005.

# Forecast on Major Forest Pest Conditions for 2006 in Alberta

## Spruce Budworm

Multi-Pher I® traps (Le Group Biocontrole, Quebec) baited with female budworm sex pheromone lures (Phero Tech Inc., B.C.) were used to monitor male spruce budworm moth populations in high-budworm-risk forest stands. The average count of male moths is used to predict the potential risk of new SBW outbreaks occurring in these stands. These procedures are described in the Spruce Budworm Management Guide" (Ranasinghe and Kominek, 1998).

The provincial outlook on risk of new outbreaks occurring in 2006 is shown on Figure 17. A detailed analysis of the data is given on the next page.

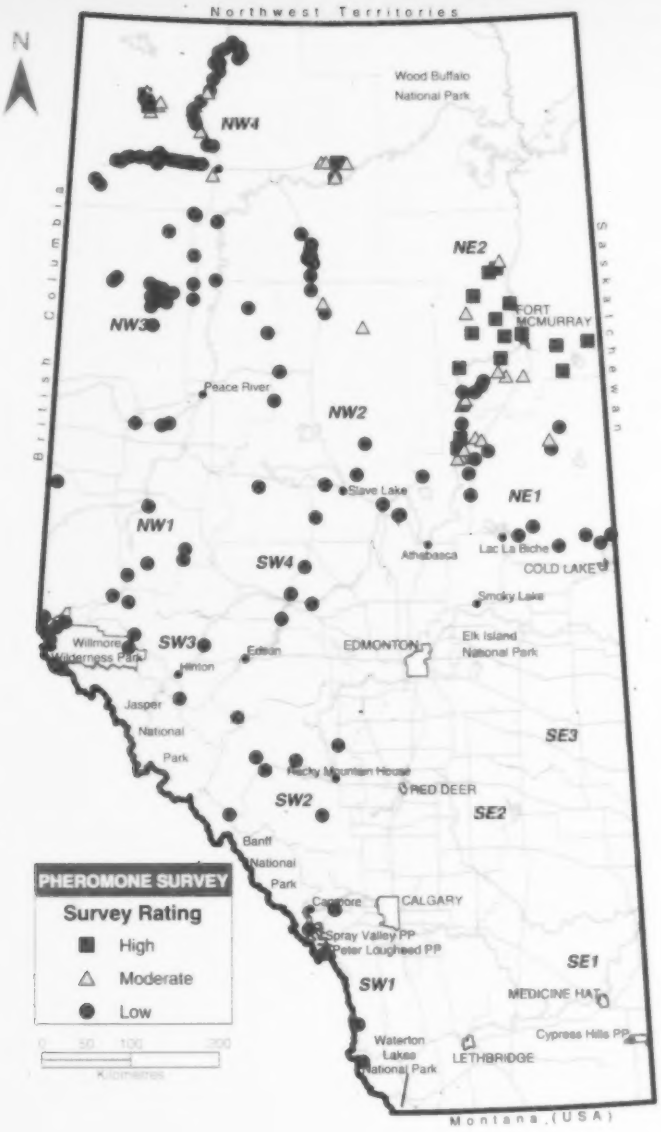


*Figure 17*
Forecast on risk of new spruce budworm outbreaks occurring in 2006, based on the number of male moths captured in pheromone-baited traps in 2005 in Alberta.

## Northeast Corporate Region (NE)

The results of the survey are summarized on Figure 17. These results show that the risk of new spruce budworm outbreaks occurring is still high in this region.

In the Lac La Biche Area (NE1), 28 plots were established; one of these plots was inactive. Compared to the 2005 forecast, there was an increase in the risk of new spruce budworm outbreaks occurring in 2006, i.e., increase in the plots with moderate or high risk.

In the Waterways Area (NE2), compared to the forecast for 2005, there was a slight increase in the percent of plots with low risk, a significant increase in the percent of plots with high risk but a substantial decrease in the percent of plots with moderate risk in 2006 (Figure 18). The number of traps and the average trap catches under each category are shown on Table 9.

The 2005 egg mass counts indicated severe budworm defoliation in 2006 in the City of Fort McMurray located in this corporate area. Thus, the risk of new spruce budworm populations occurring will stay high in 2006 within this corporate area.

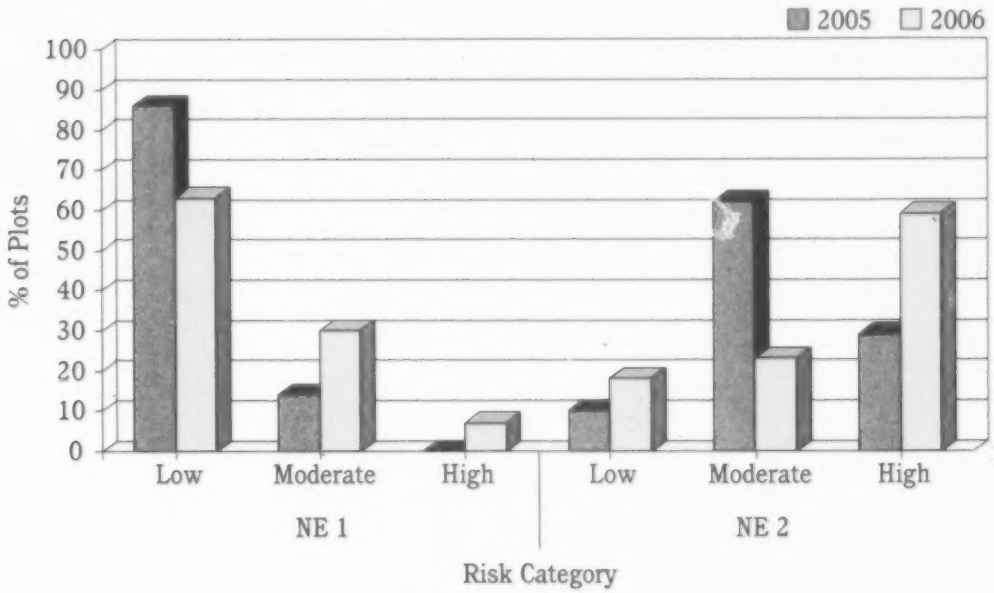


*Figure 18*
Forecasts based on male moth catches in pheromone-baited traps on risk of spruce budworm outbreaks occurring in 2005 vs. 2006 in the Northeast Corporate Region of Alberta.

*Table 9*

Summary results of spruce budworm male moths surveyed by using pheromone-baited traps in the Northeast Corporate Region of Alberta, 2005

| Corporate Area | Risk of New Outbreaks Occurring in 2006 | | | | | |
|---|---|---|---|---|---|---|
| | Low | | Moderate | | High | |
| | # of Plots | Moths/trap | # of Plots | Moths/trap | # of Plots | Moths/trap |
| Lac La Biche | 17 (63%) | 17-391 | 8 (30%) | 654-1 324 | 2 (7%) | 3 850-5 000 |
| Waterways | 4 (18%) | 35-282 | 5 (23%) | 644-1 780 | 13 (59%) | 2 034-6 700 |

## Northwest Corporate Region (NW)

In this region, 138 pheromone-baited plots were established in 2005 in co-operation with Tolko Industries - High Level (70 plots) and Manning Diversified Forest Products (11 plots).

The forecasts, based on male moth catches in pheromone-baited traps, on risk of spruce budworm outbreaks occurring in 2005 vs. 2006 in this region are shown on Figure 19.

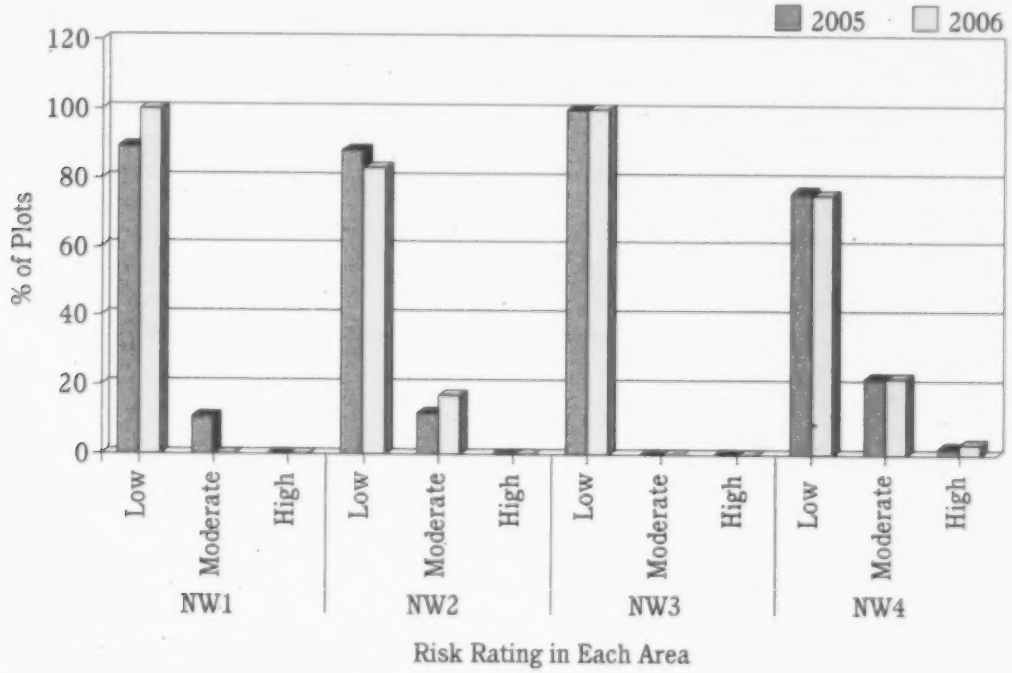


*Figure 19*

Forecasts, based on male moth catches in pheromone-baited traps, on risk of spruce budworm outbreaks occurring in 2005 vs. 2006 in the Northwest Corporate Region of Alberta.

*Table 9*
Summary results of spruce budworm male moths surveyed by using pheromone-baited traps in the Northeast Corporate Region of Alberta, 2005

| Corporate Area | Risk of New Outbreaks Occurring in 2006 | | | | | |
|---|---|---|---|---|---|---|
| | Low | | Moderate | | High | |
| | # of Plots | Moths/trap | # of Plots | Moths/trap | # of Plots | Moths/trap |
| Lac La Biche | 17 (63%) | 17-391 | 8 (30%) | 654-1 324 | 2 (7%) | 3 850-5 000 |
| Waterways | 4 (18%) | 35-282 | 5 (23%) | 644-1 780 | 13 (59%) | 2 034-6 700 |

## Northwest Corporate Region (NW)

In this region, 138 pheromone-baited plots were established in 2005 in co-operation with Tolko Industries - High Level (70 plots) and Manning Diversified Forest Products (11 plots).

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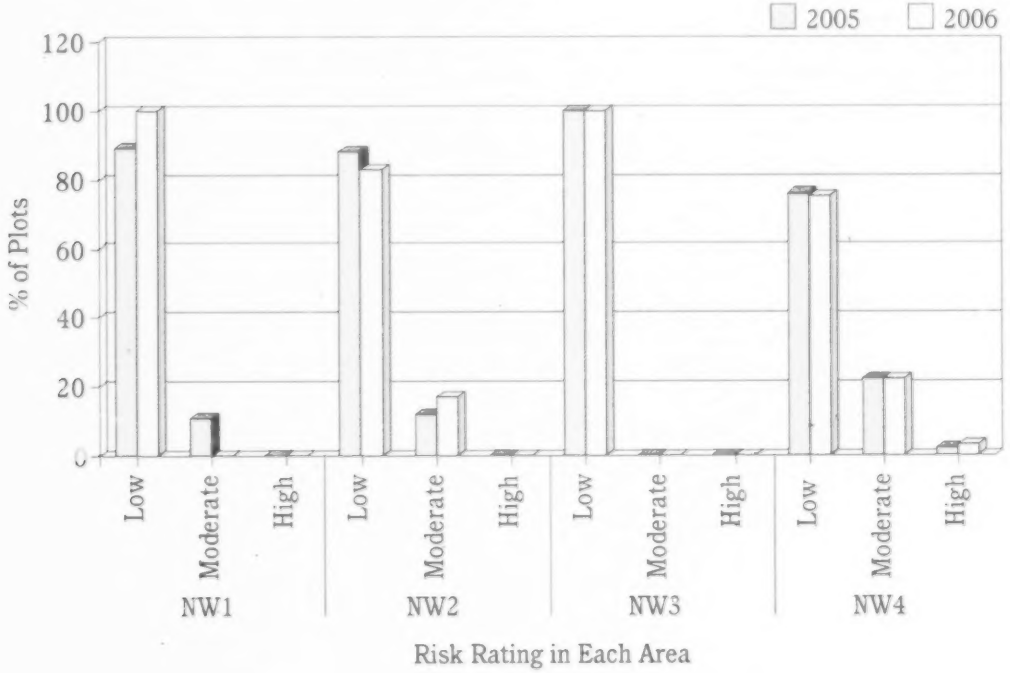


*Figure 19*
Forecasts, based on male moth catches in pheromone-baited traps, on risk of spruce budworm outbreaks occurring in 2005 vs. 2006 in the Northwest Corporate Region of Alberta.

Out of the 158 plots, the risk of new outbreaks occurring in 2006 was low in 112 (81.2%) plots, moderate in 23 (16.7%) plots and high in 3 (2.2%) plots. As shown on Figure 19, risk of outbreaks occurring in 2006 remains low, about the same as that in 2005.

The predicted risk of spruce budworm outbreaks occurring in 2006 in the corporate areas of this region is shown on Table 10. This risk is low in the Smoky (NW1) and Peace (NW3) areas; it is low to moderate in the Lesser Slave Area (NW2); and, low to high in the Upper Hay Area (NW4)

*Table 10*
Summary results of the spruce budworm male moth surveys by using pheromone-baited traps in the Northwest Corporate Region of Alberta, 2005

| Corporate Area | Risk of New Outbreaks Occurring in 2006 | | | | | |
|---|---|---|---|---|---|---|
| | Low | | Moderate | | High | |
| | # of Plots | Moths/trap | # of Plots | Moths/trap | # of Plots | Moths/trap |
| Smoky | 9 (100%) | 2-38 | 0 | 0 | 0 | 0 |
| Lesser Slave | 10 (83%) | 29-330 | 2 (17%) | 795-1 669 | 0 | 0 |
| Peace | 21 (100%) | 5-416 | 0 | 0 | 0 | 0 |
| Upper Hay | 72 (75%) | 15-457 | 21 (22%) | 515-1 977 | 3 (3%) | 2 161-3 483 |

## Southwest Corporate Region (SW)

Twenty-nine plots with pheromone-baited traps were set up as follows in this region in 2005: Southern Rockies SW1 (6); Clearwater SW2 (0); Foothills SW3 (13) and Woodlands SW4 (4). One plot in the Southern Rockies was disturbed and excluded from analysis. All the other plots had trap catches indicative of low risk of budworm outbreaks in 2007 in this region. This is expected because most of these plots are inhabited by the two-year cycle budworm, *C. biennis* Free.

In 2004, there were relatively high trap catches in some of these plots leading to a prediction of high outbreak risk in some areas of this region in 2006. However, spruce budworm populations have collapsed in most of Alberta and in B.C. If this holds true in the Southwest Region the risk of new outbreaks may be low in 2006.

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## Mountain Pine Beetle

With unusually mild winter conditions that have prevailed until the end of the year, mountain beetle populations in the province are expected to have better than normal survival. Combined with the availability of susceptible hosts and continued beetle pressure from adjoining jurisdictions, these mild weather conditions are bound to promote new MPB infestations in 2006.

Barring onset of unusually severe cold weather conditions, e.g., - 40°C for about a week in the winter, new MPB infestations can be expected in 2006 along the Eastern Slopes of the Rockies from Waterton Lake National Park in the south to Kakwa Wildland Provincial Park in the north. As well, beetle infestations are expected to occur further east as indicated by the 2005 detection of beetles in pheromone-baited plots located further east than in 2004 (Figures 7 and 20).

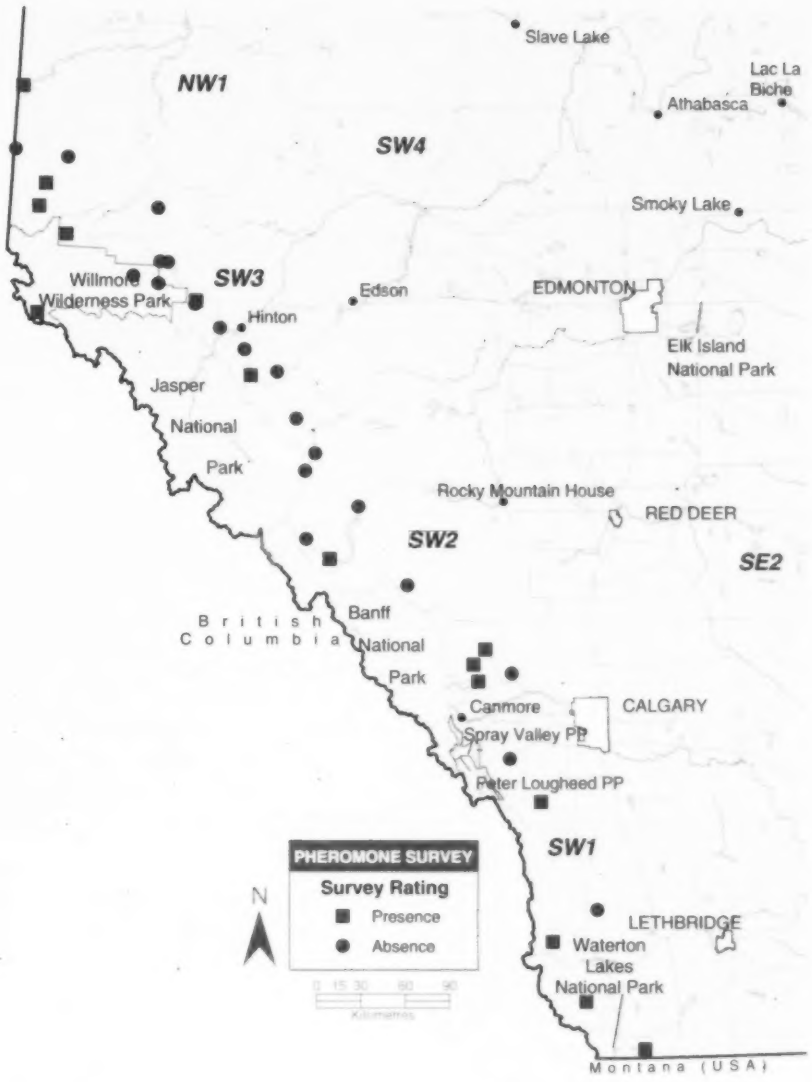


*Figure 20*
Presence/absence of mountain pine beetle hits on trees in pheromone-baited plots located in Alberta, 2005.

The MPB are expected to occur further north than before. The 2005 fall aerial overview survey map shows occurrence of suspected MPB-killed pines further north and east than before. However, these observations are yet to be verified by ground surveys (Figure 21).

The green:red ratio of infested trees provides an indication of the trend in 2005 MPB populations. A higher ratio indicates potential increase in populations. Given below are the green:red ratios observed in 2005[11]. According to these values the infestations in the south have the highest potential to expand. In the north some MPB populations have adult beetles overwintering and some others are following multi-year cycles (2-3 year) that do not bode well for population expansion.

| Location | Green:Red Ratio |
|---|---|
| Crowsnest Pass | 4:1 |
| Spray Lakes | 3:1 |
| Bow Valley | 1:1 |
| Willmore Wilderness Park | 1.6:1 |
| Kakwa Wildland Provincial Park | n/a[1] |

[1] (live beetles found in some red trees)

*Figure 21*
Locations of suspected mountain pine beetle-killed trees detected during aerial surveys carried out in the fall of 2005.

[11] Daniel Lux, Provincial MPB Program Coordinator, pers. communication

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Locations of suspected mountain pine beetle-killed trees detected during aerial surveys carried out in the fall of 2005.

[11] Daniel Lux, Provincial MPB Program Coordinator, pers. communication

# Aspen Defoliators

## Forest Tent Caterpillar

Forest tent caterpillar (FTC) moth populations in the Northwest Region were monitored by using Unitraps® baited with pheromone lures (Phero Tech Inc., B.C.). A summary of the average trap catches in 10 monitoring plots over three consecutive years is shown on Figure 22.

This figure shows relatively low catches in 2003, no signs of an increase in 2004 and but a major increase of moth catches in 2005. These increases somewhat correspond with increase in severity and extent of defoliation on the monitoring plots. However, trap catches did not foretell the impending major FTC outbreak before its occurrence. This perhaps indicates need for a large-scale monitoring program, rather than monitoring local populations, as a key factor in forecasting FTC outbreaks.

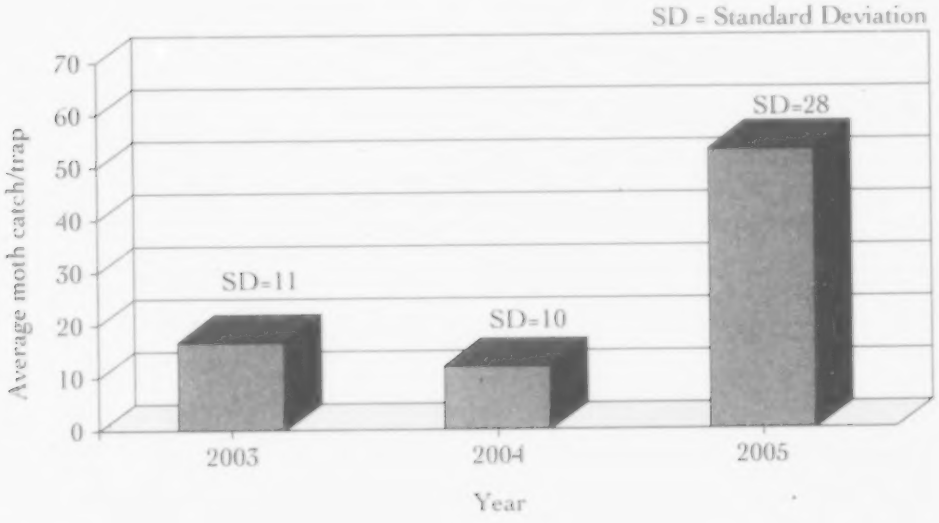


*Figure 22*
Average forest tent caterpillar moth catches in 10 Unitraps with pheromone baits deployed in the Northwest Region, 2003 - 2005.

## Exotic Pests

### Gypsy Moth

The Public Lands and Forests Division of the SRD set up 74 traps scattered over the forested Crown land of the province as a part of the annual survey conducted by the Canadian Food Inspection Agency (CFIA). Delta traps baited with Dispalure® were used for this survey. No gypsy moths were found in these traps. Thus, there is no risk of gypsy moth incidence at these 74 trap locations in 2006.

# Research and Development

## Woodborer Study

This two-year study to compare the impact of woodborer damage vs. checking in relation to the burn intensity of spring fire killed mature white spruce in northeast Alberta was concluded. The results are summarized on Figures 23 and 24 and the conclusions based on the analysis of data are summarized below:

- Overall, higher percent incidence of woodborer damage occurred in the first year post burn compared to the second; woodborer damage was significantly higher in lumber from moderately burned tress compared to those from either light or severely burned trees.
- Significantly higher incidence of checking occurred in lumber from moderately burned trees compared to lumber from trees with other burn intensities in the first year post-burn; in the second year post burn, most checking damage occurred in timber from severely burned trees (Figure 23).

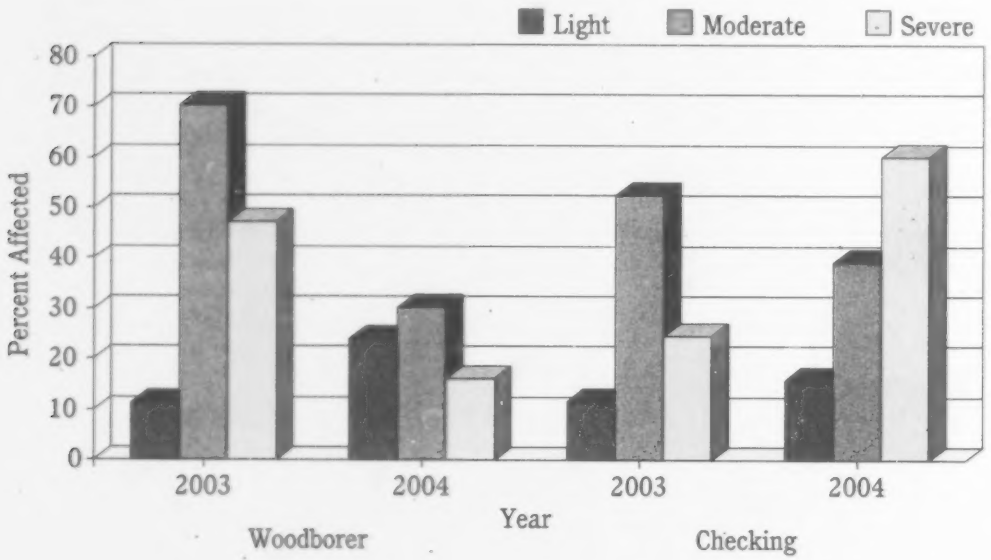


*Figure 23*
Incidence of woodborer damage vs. checking damage on lumber cut from spring wildfire burned mature white spruce in northeast Alberta.

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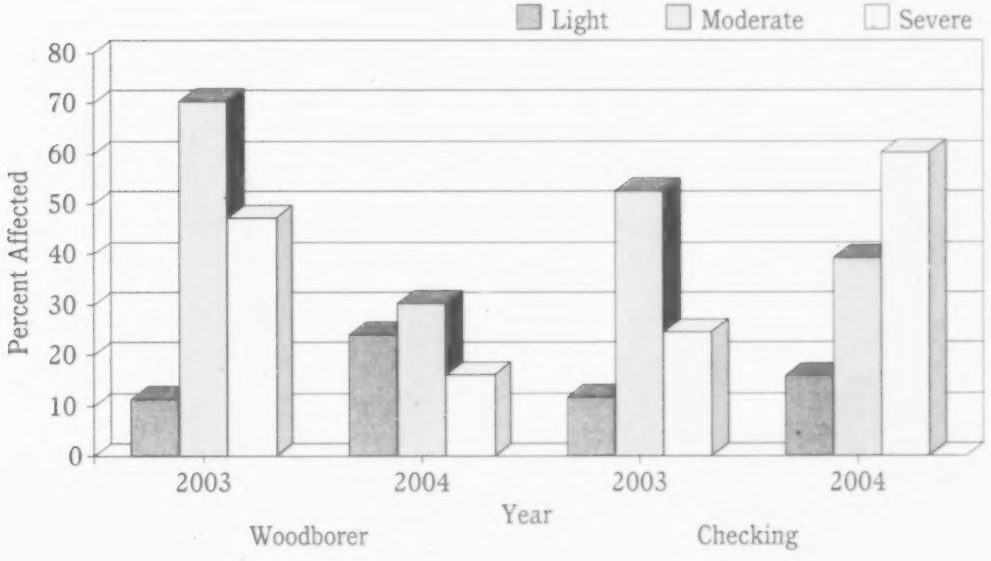



*Figure 23*
Incidence of woodborer damage vs. checking damage on lumber cut from spring wildfire burned mature white spruce in northeast Alberta.

- Overall, woodborer impact on final grade of lumber was lower than the impact of checking. Woodborer damage had no impact on grade of dimension lumber graded according to the current Standard Grading Rules for Canadian Lumber. However, in the first year post-burn, about 5% of boards from moderately and severely burned trees were downgraded due to cosmetic effects of borer damage. In the second year post-burn woodborer impact on lumber grade was negligible (Figure 24).
- Checking downgraded dimension lumber as well as boards especially in the second year post-burn; impact of checking on final lumber grade was most significant in lumber from severely burned trees in second year post-burn compared to similar lumber from first year post-burn (Figure 24).

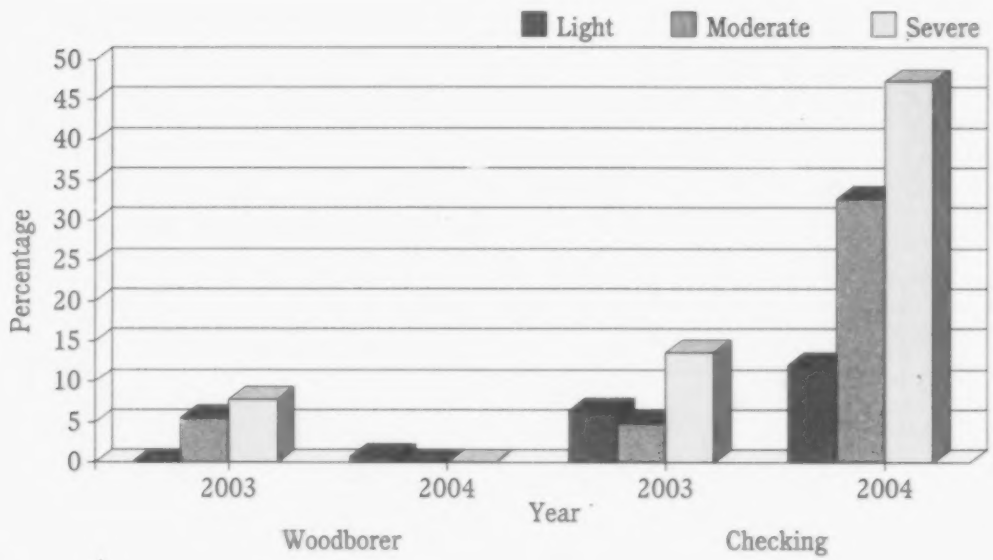



*Figure 24*
Impact of woodborer damage vs. checking damage on grade of lumber cut from spring wildfire burned mature white spruce in northeast Alberta.

# General Education, Increased Awareness and Training

## Provincial

### Provincial Integrated Forest Pest Management Forum

The ninth annual Integrated Forest Pest Management Forum was held on October 7, 2005. In addition to the updates of forest pest conditions and forest health research in the province, Dr. Staffan Lindgren delivered the keynote speech entitled "Use of pheromones in forestry with special reference to mountain pine beetle management." The proceedings of this forum are posted on the website at: http://www.srd.gov.ab.ca/forests/health/coop_ipm.html

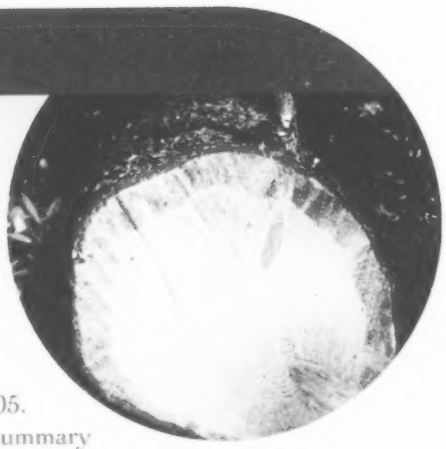
### Forest Health Web Site

The internal and external forest health web sites were regularly updated. The regular updates included forest health conditions and maps; Bugs and Diseases newsletter; annual report; Integrated Forest Pest Management Forum proceedings and forest health survey data. In addition to the regular updates, the Ministerial Order prohibiting transportation of pine with bark and news releases, updates on mountain pine beetle operations in Willmore Wilderness Park and Bow Valley were included. Legislation and info sheets on invasive plants, and guidelines on pesticide, bark beetle pheromone and biological control use also were posted on this website. The external web site address is: http://www.srd.gov.ab.ca/forests/health/index.html

### Alberta/B.C. Intermountain Forest Health Workshop

Sustainable Resource Development hosted the 13th annual workshop in April 20-21, 2005 in Lake Louise. The scope of this workshop was for multiple provincial and federal agencies to share and discuss primary forest health monitoring, research, and management initiatives and/or issues of concern along the Alberta/British Columbia border. Topics included insects and disease as well as invasive plants.

# References

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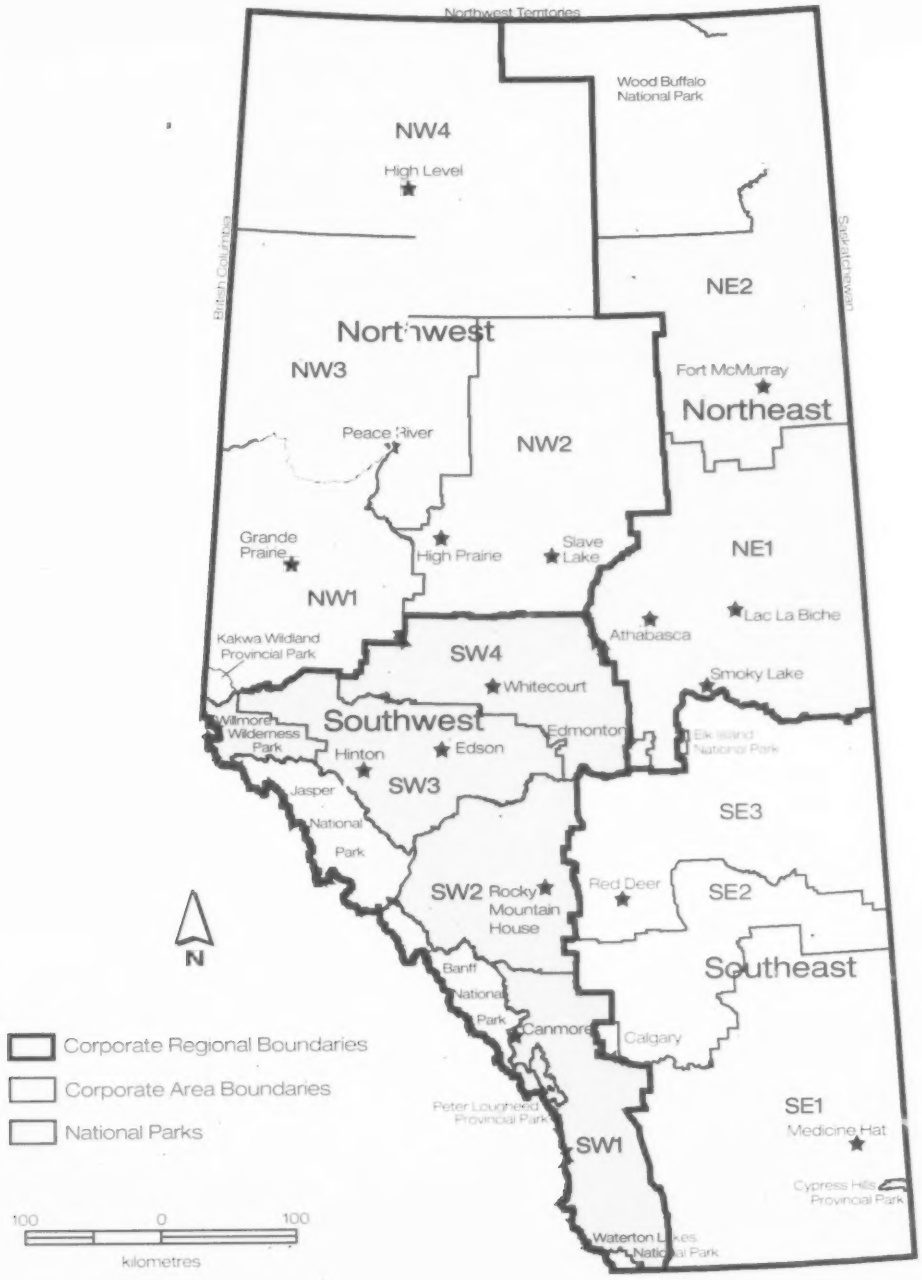
# Appendixes

## Appendix I

### Corporate Regions and Areas of Alberta, 2005



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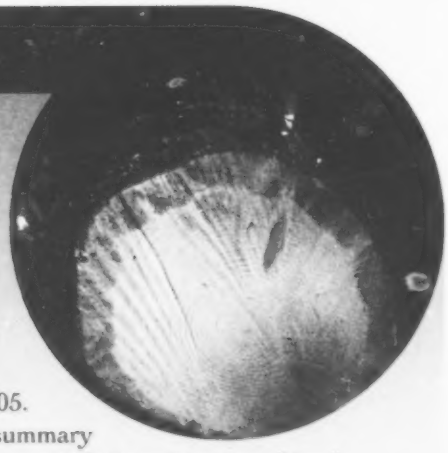

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# Appendixes

## Appendix I

### Corporate Regions and Areas of Alberta, 2005

# Appendix II

## Information on Operational Use of Pheromones in Alberta, 2005

### Forest Tent Caterpillar

| | |
|---|---|
| Chemical component(s): | Z5, E7 - dodecadienal |
| Lure type: | Flexlure® |
| Trap type: | Uni-trap® |
| Pheromone source: | Phero Tech Inc., Delta, British Columbia |

### Gypsy Moth

| | |
|---|---|
| Chemical component(s): | (+)cis-7, 8-epoxy-2-methyloctadecane |
| Lure type: | Disparlure® |
| Trap: | Delta sticky trap |
| Pheromone source: | Trécé Inc., Salinas, California (purchased and distributed by Canadian Food Inspection Agency) |

### Mountain Pine Beetle

| | |
|---|---|
| Chemical component(s): | trans-verbenol, exo-brevicomin |
| Lure type: | Pre-packed tree-bait |
| Trap: | not applicable |
| Pheromone source: | Phero Tech Inc., Delta, British Columbia |

### Spruce Budworm

| | |
|---|---|
| Chemical component(s): | 95% E-11-tetradecenal, 5% Z-11-tetradecenal |
| Lure type: | Plastic lure |
| Trap type: | Multi-Pher I® |
| Pheromone source: | Phero Tech Inc., Delta, British Columbia |

# Appendix III

## Names of Invasive Plant Species That Commonly Occurred in 2005 on Forested Crown Land in Alberta

Bull thistle - *Cirsium vulgare* (Savi.) Ten.

Canada thistle - *Cirsium arvense* (L.) Scop.

Common tansy - *Tanacetum vulgare* L.

Toadflax - *Linaria vulgaris* Hill.

Field scabious - *Knautia arvensis* (L.) Duby

Hound's-tongue - *Cynoglossum officinale* L.

Nodding thistle - *Carduus nutans* L.

Orange hawkweed - *Hieracium aurantiacum* (L.)

Oxeye daisy - *Chrysanthemum leucanthemum* L.

Perennial sow thistle - *Sonchus arvensis* L.

Scentless chamomile - *Matricaria perforata* Merat.

Tall buttercup - *Ranunculus acris* L.

White cockle - *Silene alba* (Mill.) E. H. L. Krause

Wild caraway - *Carum carvi* (L.)